

# City of Franklin, Tennessee

## Franklin Water & Wastewater Department

### Standard Water & Wastewater Guidelines Specifications & Details



Approved By: Eldy Woodard Director 8/23/02  
Name Title Date

File No.: 13851-02  
Date: August 2001

**BWSC** | BARGE  
WAGGONER  
SUMNER &  
CANNON, INC.

211 Commerce Street, Suite 600 • Nashville, Tennessee 37201-1811 • (615) 254-1500

ENGINEERS

ARCHITECTS

PLANNERS

LANDSCAPE ARCHITECTS

SURVEYORS

## TABLE OF CONTENTS

### CHAPTER 1 INTRODUCTION

| <u>NO.</u> | <u>PARAGRAPH</u>                | <u>PAGE</u> |
|------------|---------------------------------|-------------|
| 1.1        | MISSION STATEMENT               | 1           |
| 1.2        | PURPOSE OF THE STANDARDS MANUAL | 1           |
| 1.3        | UPDATES TO THE STANDARDS MANUAL | 2           |
| 1.4        | FRANKLIN MUNICIPAL CODES        | 2           |

## **CHAPTER 1 INTRODUCTION**

### **1.1 MISSION STATEMENT**

The City of Franklin, Tennessee Water and Wastewater Department, is committed to protecting the waters of Tennessee and providing the healthiest environment for the people of Franklin and Williamson County. Furthermore, the Authority will aid in the advancement of local economic development by providing these services at the most prudent cost. The City of Franklin, Tennessee Water and Wastewater Department, is dedicated to fulfilling these precepts by only the highest and most ethical standards.

### **1.2 PURPOSE OF THE STANDARDS MANUAL**

These Standards are guidelines for Developers, their Engineers and Contractors for the planning, design and construction of sanitary sewers, small wastewater pumping stations, water distribution systems, and associated appurtenances within the City of Franklin, Tennessee, Water and Wastewater Departments, hereinafter identified as the "City of Franklin", service area.

These Standards shall govern the construction materials and installation of water distribution systems and wastewater collection systems that are, or will become, the responsibility of the City of Franklin to operate and maintain as part of their system.

These Standards are intended to meet or exceed the requirements of the State of Tennessee's Department of Environment and Conservation (TDEC) and to aid the Engineer in his design of water distribution systems, wastewater collection systems and wastewater lift stations. This design should incorporate the highest level of standards of practice and specify materials of highest quality identified in the technical specifications.

The Standards identify a single set of standards, criteria, submittal requirements and approval procedures to be used in the planning, design, and construction of projects within the City of Franklin service area.

These Standards are not intended to serve as a step-by-step design and construction method nor can this manual address every situation that may arise. The application of sound engineering/surveying principles combined with the information contained herein is necessary to complete the planning, design, and construction for wastewater collection projects.

### 1.3 UPDATES TO THE STANDARDS MANUAL

As design criteria and construction materials and methods evolve, the Standards will require revisions and improvements. As revisions are made or supplemental information is required, they will be sent to all registered holders of the Standards. It will be each registered holder's responsibility to maintain an updated copy of the Standards. Therefore, he/she should contact the City of Franklin for the most current Standards prior to commencing any design or construction.

Comments and suggestions concerning the context and format are welcome from the users of the Standards. Comments and suggestions should be forwarded to:

City of Franklin  
ATTN: Standards Manual Coordinator  
Water and Wastewater Department  
405 Hillsboro Road, P.O. Box 487  
Franklin, Tennessee 37065

### 1.4 FRANKLIN MUNICIPAL CODES

The City of Franklin has established ordinances dictating rules and regulations applicable to the trade of plumbing, regulating the installation and use of plumbing connections and fixtures and regulating the use of public and private sewers and drains, private sewer disposal, the installation and connection of building sewers, and the discharge of water and waste into the public wastewater system, including wastewater pretreatment program administration, industrial discharge limits, surcharge rates and formula, enforcement of pretreatment and wastewater use regulations, fees and rates, and penalties for violation thereof.

Developers are encouraged to familiarize themselves with applicable sections of these ordinances as they relate to the development of property within the City of Franklin service area. Copies of these ordinances may be obtained by requesting in writing from the City of Franklin. For address see Paragraph 1.3.

## TABLE OF CONTENTS

### CHAPTER 2 PLANNING AND DESIGN INFORMATION

| <u>NO.</u> | <u>PARAGRAPH</u>                                   | <u>PAGES</u> |
|------------|--|--------------|
| 2.1        | PURPOSE  | 4            |
| 2.2        | DEFINITIONS  | 4            |
| 2.3        | APPROVAL FOR SERVICE                               | 5            |
| 2.4        | INITIAL PLAN SUBMITTALS                            | 6            |
| 2.5        | CONSTRUCTION PLANS                                 | 7            |
|            | 2.5.1 Plan Sheet Requirements                      | 7            |
|            | 2.5.2 Return of Plans                              | 8            |
| 2.6        | DESIGN CONSIDERATIONS                              | 8            |
|            | 2.6.1 Waterline Design Considerations              | 8            |
|            | 2.6.2 Wastewater-line Design Considerations        | 10           |
|            | 2.6.3 Easements                                    | 11           |
|            | 2.6.4 Water Booster Station Design Considerations  | 12           |
|            | 2.6.5 Water Storage Facilities Design Construction | 12           |
|            | 2.6.6 Lift Station Design Consideration            | 13           |
|            | Process Diagram                                    | 14           |



## **CHAPTER 2 PLANNING AND DESIGN INFORMATION**

### **2.1 PURPOSE**

The purpose of these guidelines and specifications is to provide a guide for the planning, design and construction of water distribution systems, wastewater collection systems and associated appurtenances for the Developers and their Engineers and Contractors in order to achieve an acceptable installation of water service to subdivisions and other developments within the City of Franklin service area. A process diagram generally depicting the steps necessary for extending or adding water and/or wastewater lines to the City of Franklin Water and/or Wastewater Systems is included at the end of this chapter.

The inspection services provided by the Water and Wastewater Department are limited only for the installation of water and/or wastewater lines, prefabricated pumping stations and their appurtenances. The Department's inspection should not be construed to be comprehensive in nature. Inspection by the Water and Wastewater Department does not relieve the Contractor of the responsibility to comply with the specifications nor does it guarantee against any failure during the construction phase or the one-year warranty period due to inferior material or workmanship of the Contractor. *NO CONNECTION TO AN EXISTING WATER OR WASTEWATER LINE SHALL BE MADE UNTIL ALL LINES HAVE BEEN COMPLETELY TESTED AND APPROVED BY THE DEPARTMENT'S FIELD REPRESENTATIVE.*

### **2.2 DEFINITIONS**

Field Representative - City of Franklin, Water and Wastewater Department's Project Inspector.

Owner - City of Franklin Water and Wastewater Department

Plans - Drawings, details, specifications, survey, plats and any other documents used to communicate design information to a Contractor or regulator necessary to construct improvements, extensions or modifications to the City of Franklin, Water and Wastewater Systems.

Department - City of Franklin, Water and Wastewater Department

City - City of Franklin, Williamson County, Tennessee

Planning Commission - City of Franklin Planning Commission

Developer - Owner of a proposed development in which water and/or wastewater lines are to be located.

Contractor - Contractor who is installing water and/or wastewater lines in a proposed development.

Design Engineer - One who has prepared the construction plans for the installation of water and/or wastewater lines in a proposed development. As provided by the laws of Tennessee, the Design Engineer must be a registered professional engineer.

W/S - Water and/or wastewater lines and appurtenances

TDEC - Tennessee Department of Environment and Conservation, Division of Water Supply and the Division of Water Pollution Control.

## 2.3 APPROVAL FOR SERVICE

Prior to preparing any plan, the Developer or anyone interested in extending a water and/or wastewater line on the City of Franklin Water and Wastewater Systems shall submit a request to the Board of Mayor and Aldermen for permission to construct the extension or addition to the system. The request shall be submitted to the appropriate Bond committee at least ten days in advance of its regular scheduled meeting, be in written form addressed to the Chairman of the Committee and shall include the following:

- A. Name of Developer with address and telephone number.
- B. Name and location of proposed development.
- C. Nature of development.
- D. Approximate number of water and/or wastewater system customers to be added to system.
- E. Estimate of daily water consumption and daily wastewater discharge.
- F. Approximate planned start of construction and completion of construction.

The Board shall act on the request in a timely manner and shall notify the Developer of its decision in writing.



## 2.4 INITIAL PLAN SUBMITTALS

- 2.4.1 All plans shall be submitted to the City of Franklin, Department of Engineering with a letter of transmittal and a check for the plan review fee in the amount of \$600 (\$300 for water and \$300 for wastewater). Said plan review fee shall be used to cover the cost of reviewing and processing the plans. This fee shall be paid for each project submitted. Submissions shall include, as a minimum:
- A. Five (5) sets of plans including a vicinity map, shall be submitted to the Department for the initial review.
  - B. Preliminary plat showing the plan development.
  - C. Specifications for items not contained herein.
  - D. No utility plans will be reviewed until the development plans have received preliminary approval by the Planning Commission.
  - E. Engineering reports including design criteria used in sizing mains and/or pumping stations, as required.
- 2.4.2 Plans will be reviewed by each appropriate City Department and will be stamped and signed as to approval/disapproval then returned to the Design Engineer or Developer for corrections if required.
- 2.4.3 After approval by the City of Franklin, approval of the plans and specifications by the Tennessee Department of Environment and Conservation, Tennessee Department of Transportation, Railroads, Corps of Engineers, Tennessee Valley Authority, and/or any other agency having jurisdiction is required before beginning construction. One set of plans bearing the TDEC approval stamp and a copy of the TDEC approval letter are to be provided to the Department before any construction begins.
- 2.4.4 It is anticipated that plan reviews will be completed by the City of Franklin within thirty (30) days of submission. In addition to water and wastewater facilities, submitted plans shall include finished grades for the roadways, curbs, gutters, sidewalks and ground as well as the location, size and invert elevation of other utilities and drainage structures. The plans shall also include the latest revision date if applicable.

## 2.5. CONSTRUCTION PLANS

The following are minimum guidelines for the preparation of water line additions or extension plans and should not be construed as being the total requirements. The City of Franklin may, at its option, require additions to be made in the plans where circumstances warrant.

### 2.5.1 PLAN SHEET REQUIREMENTS

- A. All plans shall be stamped by a Tennessee Licensed Professional Engineer.
- B. Plans shall be drawn on a standard 24" x 36" sheet.
- C. A cover sheet shall be made a part of all plans, and shall incorporate a location map on an approximate scale not less than 1" = 1,000', the name of the project, and the names, addresses and telephone numbers of the Developer and the Engineer.
- D. The plan scale will be: Plan 1" = 50' or 1" = 100', profile where applicable 1" = 5' or 1" = 10' vertical. Show profiles of all wastewater lines (for all mains and gravity lines) and of water lines 16" and larger.
- E. The direction of North should be clearly shown on all sheets.
- F. Show all existing and proposed utilities, including septic drain fields, wastewater, gas, electric, telephone, cable TV, and storm sewers on the plans with measurements and/or details of proposed clearances of same.
- G. Show all topographic features such as driveways, pavements, right-of-ways, property lines, storm drainage, structures, etc., especially those which may conflict with the proposed water and wastewater mains.
- H. Show the limits of all existing and proposed easements.
- I. Provide grading and drainage plans of subdivisions including typical section of roadways.
- J. Clearly define which roads in proposed subdivisions are to be public and which are to be private.

- K. Detailed plans and specifications shall be submitted by the Engineer employed by the Developer for any special condition or structures such as pumping stations, creek crossings, etc., and approved by the City of Franklin and other agencies prior to the pre-construction conference.
- L. The City of Franklin reserves the right to relocate water and/or wastewater lines on the construction plans to facilitate maintenance and to provide service for adjacent properties.
- M. Sizes and locations of water and/or wastewater lines, valves, and hydrants and all construction shall be in accordance with the plans approved by the City of Franklin.

2.5.2 RETURN OF PLANS: After plans have been approved by the City of Franklin, they will be returned to the Developer's Engineer for submission to the Tennessee Department of Environment and Conservation. The Developer's Engineer will pay all state required fees.

## 2.6 DESIGN CONSIDERATIONS

### 2.6.1. WATERLINE DESIGN CONSIDERATIONS

- A. The water system shall be sufficiently designed to provide proper service to all levels of a building requiring water service. The water system operates with storage facilities having overflow elevations at about 854 feet above sea level. In certain areas, high level systems exist to provide pressures for satisfactory operation. In general, any building at or above 750 feet above sea level will have to be serviced by a high level system.
- B. Generally the following locations should be utilized for location of new water lines unless field conditions such as other utilities, etc., make it impractical to do so.
  - 1. New Subdivisions - New water mains shall be in the right-of-way near the edge of pavement parallel to the property line, unless otherwise approved by the City of Franklin and shall not be located under sidewalks. Dual feeds shall be required unless otherwise approved by the City of Franklin.
  - 2. Along older roads in existing subdivisions which have open ditches, the water main shall be located in easements unless otherwise approved by the City of Franklin.

3. Service lines shall generally be located in the center of the building lot and/or out of the way of driveways, landscaping, headwall, etc.
  4. Where underground electrical service exists or is proposed, the water line must be located on the opposite side of the road.
  5. Where gas lines exist or are proposed there must be at least 10' horizontal separation between the water line and gas line and a minimum 12" vertical separation between the two lines.
- C. Water valves should generally be spaced a maximum of 1,000' along a water main and on all lines at each intersection, and should be located on the right-of-way line extended.
  - D. A fire hydrant shall be installed at the end of 6" and larger dead end water mains.
  - E. The fire hydrant location in subdivisions must be approved by the City Fire Department as well as the Water and Wastewater Department, however, in no case shall fire hydrants be placed at a distance greater than 250' from the furthest point of any building.
  - F. Private fire protection systems shall have installed in the line a detector/double check valve Watt's 709 DDC or equal and the installation shall be approved by the Department.
  - G. In proposed transmission mains, air release valves at high points must be provided.
  - H. Provide detailed drawings for unusual conditions such as stream crossings, railroad crossings, highway crossings, etc.
  - I. Reduced pressure backflow preventors (RPBP) shall be installed where required by the City of Franklin. In general, all commercial and industrial water service lines shall have an approved RPBP. Details of this installation shall be approved prior to installation. The RPBP shall be installed such that it is protected from freezing and in a manner to allow for proper drainage and testing.
  - J. Hydraulic calculations and data shall be submitted for the proposed system including estimated flow demands, both domestic and fire flows, based on State Design criteria and recommendations of the National Board of Fire Underwriters.

## 2.6.2. WASTEWATER LINE DESIGN CONSIDERATIONS

- A. The wastewater system shall be sufficiently designed to provide proper service to all levels of a building requiring wastewater service.
- B. Generally the following locations should be utilized for location of new wastewater lines unless field conditions such as other utilities, etc., make it impractical to do so.
  - 1. New Subdivisions - New mains to be in the center of the roadway where practical unless otherwise approved by the Wastewater Department and shall not be located under sidewalks.
  - 2. Along older roads in existing subdivisions that have open ditches, the main shall be located in easements unless otherwise approved by the Wastewater Department.
  - 3. Service lines shall generally be located 10' from the water service line and on the downstream side and/or out of the way of driveways, landscaping, headwalls, etc.
  - 4. Where underground electrical service exists or it is proposed, the wastewater line and service laterals must be located a minimum of 18 inches vertical separation below the electric service.
  - 5. Where gas lines exist or are proposed there must be at least 10' horizontal separation between the wastewater line and gas line and a minimum 12" vertical separation between the two lines.
- C. Wastewater valves should be located at agreed upon locations between the Developer's Engineer and the City of Franklin.
- D. On proposed force mains, air release valves or combination air valves at high points must be provided.
- E. Provide detailed drawings for unusual conditions such as stream crossing, railroad crossings, highway crossings, etc.
- F. Backflow preventors shall be installed where required by the City of Franklin. In general, lift stations shall have an approved backflow preventor. Details of this installation shall be approved prior to installation. The backflow preventor shall be installed such that it is protected from freezing and in a manner to allow for proper drainage and testing.

- G. Hydraulic calculations and data shall be submitted for the proposed system including estimated flow demands, hydraulic profile, system curves, system head, proposed pump curves and wetwell calculations, based on State design criteria.

### 2.6.3. EASEMENTS

- A. Water and/or Wastewater Mains: When required, permanent easements must be provided with a minimum width of 20 feet. Easement width requirements are as follow:
  - 1. 0'-12' depth requires 20' easement.
  - 2. 13'-20' depth requires 30' easement.
  - 3. Depths greater than 20' requires prior approval.

When a main is proposed in a developed area, a minimum 10-foot wide temporary construction easement on each side of the permanent easement must also be provided.

- B. Easements for water and/or wastewater line extensions may be provided in either of two ways.
  - 1. Easement Document on forms provided by the Department, which must include legal description of the easement(s), legal Owners name, map and parcel, and must be signed by the Owner; and then notarized and recorded.
  - 2. Record with Subdivision Plat - If this method of recording easements is chosen, a preliminary plat of the subdivision must be provided at the time of plans submittal, which clearly defines the easements to be recorded.
- C. All easements for work on property not owned by the Developer must be obtained and recorded before construction can begin. In new subdivisions, the letter of intent and preliminary plat showing the easements will be sufficient to start construction. However, the Final Plat must be recorded and delivered prior to final inspection of the new facilities by the Department.
- D. Special permits such as Aquatic Resource Alteration, Railroad crossings, T.V.A. crossings and State Highway crossings must be prepared by the Developer's Engineer. Any costs associated with these permits will be paid for by the Developer.

#### 2.6.4 WATER BOOSTER STATION DESIGN CONSIDERATIONS

- A. Generally water booster pumping facilities shall be designed to maintain the sanitary quality of the pumped water and shall conform to good municipal practice and to the "Design Criteria for Community Public Water Systems" as established by the Tennessee Department of Environment and Conservation. No booster station shall be subject to flooding.
- B. Booster stations shall be so located such that the site will meet the requirements for sanitary protection of the water quality as well as the hydraulics of the system. The stations shall be within a fenced area and provided with a permanent asphalt drive accessible at all times, as well as site preparation, landscaping, etc.
- C. At least 2 pumping units shall be provided for each station with each pumping unit having the capability of pumping the peak demand. The booster pumps shall be located so that they will not produce less than 30-psi pressures anywhere in the distribution system. The suction line pressure shall be maintained above 30 psi by the use of a pressure sustaining valve or low pressure cutoff device.
- D. All stations shall be provided with automatic signaling apparatus which will report when the station is out of service, low pressure, high pressure, power loss, etc., and must be compatible with the City's existing equipment.
- E. Shop Drawings for booster stations shall be submitted to and approved by the Water Department prior to actual purchase of the booster station equipment. Preliminary discussions with the Water Department concerning the booster station design are encouraged before preparation of plans so specific design requirements can be established.

#### 2.6.5 WATER STORAGE FACILITIES DESIGN CONSIDERATIONS

- A. The materials and design used for water storage reservoir shall provide stability and durability as well as protection of the quality of the stored water. The design of the water storage reservoir shall conform to the "Design Criteria for Community Public Water Systems" as established by the Tennessee Department of Environment and Conservation and the applicable current American Water Works Association (AWWA) standards; AWWA D 100 for Welded Steel Tanks for Water Storage or AWWA D110 for Wire Wound Circular Pre-stressed Concrete Water Tank. Construction materials for water storage reservoirs shall be pre-approved by City of Franklin.

- B. Tank water level monitoring shall be provided on all water storage reservoirs and must be compatible with the City's existing equipment. The system shall be capable of providing for continuous monitoring of the reservoir level. The data receiver shall be located at Franklin's Lewisburg Pike Water Treatment Plant.
- C. Disinfection of the completed water storage reservoir shall be accomplished with a chlorine solution in accordance with provisions of AWWA D105, Latest Revision, "Disinfection of Water Storage Facilities". Disinfection shall not be attempted until at least 7 days after completion of the interior paint coating (or longer if recommended by the paint manufacturer). All work including the installation of a cathodic protection system (if required) shall be completed prior to disinfecting.

#### 2.6.6 WASTEWATER LIFT STATION DESIGN CONSIDERATIONS

- A. Generally sewage pumping facilities shall be designed to maintain the quality of the waters of Tennessee and shall conform to good municipal practice and to the "Design Criteria for Municipal Facilities Section" as established by the Tennessee Department of Environment and Conservation, Division of Water Pollution Control. No lift station shall be subject to flooding.
- B. Lift stations shall be so located such that the site will meet the requirements for sanitary protection of the water quality as well as the hydraulics of the system. All stations shall be located within a site prepared, landscaped, fenced area and provided with a permanent asphalt drive accessible at all times.
- C. Pumping stations shall, where possible, be designed to utilize equipment similar to that already utilized by the Water and Wastewater Department. At least 2 pumping units shall be provided for each station with each pumping unit having the capability of pumping the peak demand.
- D. All stations will be required to have emergency standby capacity, either dual power source or generator (when directed by the City), alarm system, flow meter(s) on the common discharge force main, and water supply for maintenance.
- E. All stations shall be provided with automatic signaling apparatus which will report when the station is out of service, low level, high wetwell, etc., and be compatible with City's existing equipment.
- F. Shop Drawings for lift stations shall be submitted to and approved by the City of Franklin prior to actual purchase of the lift station equipment. Preliminary discussions with the Department concerning the lift station design are encouraged before preparation of plans so specific design requirements can be established.



## PROCESS

- STEP 1: The Developer shall submit a WRITTEN REQUEST for extension or addition.
- STEP 2: The Mayor and Alderman disapprove or approve the project.
- STEP 3: The Developer will contract with an Engineer to design the proposed water and/or wastewater extensions.
- STEP 4: Developer and Engineer prepare construction drawings.
- STEP 5: INITIAL PLAN submittal of construction drawings to City of Franklin for review.
- STEP 6: Developer, his Engineers and City of Franklin meet to discuss comments made during the review.
- STEP 7: The Developer returns the plans and specifications for City of Franklin approval.
- STEP 8: The Developer's Engineer submits approval copies of the plans and specs to TDEC for approval and any other agency having jurisdiction and obtain all necessary permits and easements.
- STEP 9: Developer and/or his contractor sets up a PRECONSTRUCTION CONFERENCE with City representatives and pays all fees.
- STEP 10: *BEGIN CONSTRUCTION*- Must obtain "Permit to Construct" and provide minimum 48-hour notification.
- STEP 11: Developer and Contractor set up final inspection.
- STEP 12: City of Franklin accepts project, issues "Certificate of Acceptance."

## TABLE OF CONTENTS

### CHAPTER 3 CONSTRUCTION GUIDELINES

| <u>NO.</u> | <u>PARAGRAPH</u>                              | <u>PAGES</u> |
|------------|---|--------------|
| 3.1        | PURPOSE                                       | 16           |
| 3.2        | PRECONSTRUCTION CONFERENCE                    | 16           |
|            | 3.2.1 Before the Pre-construction Conference  | 16           |
|            | 3.2.2 Developer is to have at Conference      | 17           |
| 3.3        | ABILITY TO PERFORM                            | 17           |
| 3.4        | INSPECTION                                    | 18           |
|            | 3.4.1 Determining Inspection Fee              | 18           |
|            | 3.4.2 Workmanship                             | 19           |
|            | 3.4.3 Job-site Safety                         | 20           |
| 3.5        | FINAL INSPECTION                              | 20           |
|            | 3.5.1 Scheduling a Final Inspection           | 20           |
|            | 3.5.2 Issuance of "Certificate of Acceptance" | 21           |
| 3.6        | ANNUAL INSPECTION                             | 21           |
| 3.7        | RECORD DRAWINGS                               | 21           |
|            | 3.7.1 General Requirements                    | 21           |
|            | 3.7.2 Drawing Information                     | 22           |
| 3.8        | STANDARDS FLEXIBILITY                         | 23           |
|            | Permit to Construct (Form A)                  | 24           |
|            | Certificate of Acceptance (Form B)            | 26           |

## **CHAPTER 3 CONSTRUCTION GUIDELINES**

### **3.1 PURPOSE**

This chapter establishes the procedures that must be followed by Developers, Engineers, and Land Surveyors concerning the construction of approved water and/or wastewater distribution/collection systems. This chapter will outline the requirements for a pre-construction conference, inspection services, final inspection and preparation of Final Record Drawings to ensure that all proposed water and/or wastewater facilities construction plans correctly depict the facilities as constructed.

### **3.2 PRECONSTRUCTION CONFERENCE**

Before beginning any construction, and after the plan approval process is complete, the Developer or his Engineer shall schedule a Pre-construction Conference to be held between the Contractor, Developer, Developer's Engineer, and the City and their Engineer. At this meeting, the Contractor will be informed of the City's policies and any special requirements. Listed below is a CHECKLIST of items relating to the pre-construction conference.

#### **3.2.1 BEFORE THE PRE-CONSTRUCTION CONFERENCE:**

- A. Developer is to schedule and coordinate conference at least 7 days prior to conference.
- B. Developer, or his Engineer, is to have project plans approved by all agencies prior to conference.
- C. Contractor is to have shop drawings approved by the Department prior to the pre-construction conference. (The Department may waive this requirement on pump stations).
- D. When submitting plans and shop drawings to the Department, the Department will retain three (3) copies. Shop drawings, including but not limited to, pipe, fire hydrants, valves, manholes, castings, service pipe and other major appurtenances, will not be reviewed unless they have been checked by the Contractor and stamped by him to indicate that they meet the specifications.

- E. Shop drawings for pipe, valves, hydrants, etc., shall be submitted to the Department a minimum of seven (7) calendar days prior to the pre-construction conference for review and approval after being thoroughly checked by the Contractor and dated and stamped with his approval.
- F. Upon request by the Department, laboratory test reports shall be provided on all pipe to assure that it meets the requirements of these specifications.
- G. If construction has not started within one year from the date of approval, utility plans will have to be resubmitted to renew approval.
- H. Permits for pavement cuts or crossing of public roads including any special backfill and pavement repair as required by the Agency having jurisdiction are the responsibility of the Developer. A bond shall be provided to the Department by the Developer to cover all costs of repair and maintenance of roads for a period of one year from date of acceptance of the project for all work performed in existing rights-of-way of all roads in Williamson County and all State Highways. The amount of this bond shall be determined by the Department after it receives all requirements for repairs from the Williamson County Highway Department or Tennessee Department of Transportation.

### 3.2.2 DEVELOPER IS TO HAVE AT CONFERENCE:

The Developer must schedule a conference prior to beginning construction. The Developer must have plans and specifications (where applicable) that have been approved by the Department and the Tennessee Department of Environment and Conservation, and the State's approval letter.

### 3.3 ABILITY TO PERFORM

The Developer may be asked to establish, to the satisfaction of the Department, that the Contractor proposed to be used on any project, is to be approved by the Department as one who has the ability to perform the Contract and meets at least the minimum standards set forth below. Such factors as judgment, skill, and integrity will play an important part in the overall determination. Although additional criteria may be used, a responsible Contractor must at least:

- A. Have adequate financial resources or the ability to secure such resources to successfully perform the proposed Contract safely, with minimum impact on the general public in a reasonable time frame.

- B. Have the necessary experience, organization, and technical qualifications and have or show proof that he can acquire the necessary equipment to perform the proposed Contract;
- C. Be able to comply with all required performance schedules or completion dates, taking into account Contractor's existing commitments;
- D. Have a satisfactory record of performance, integrity, judgment, and skills;
- E. Be otherwise qualified and eligible to receive an award under applicable laws and regulations;
- F. Maintain a permanent place of business.

The Developer may be required to furnish the Department information sufficient to show that the proposed Contractor and its subcontractors and supplies currently meet these minimum standards.

### 3.4 INSPECTION

All projects shall be subject to inspection during and upon completion of construction by an authorized representative of the Department. Inspection shall consist of resident inspection by the Department. Presence or absence of the inspector during construction does not relieve the Developer and/or Contractor from adherence to approved plans and specifications.

#### 3.4.1 DETERMINING INSPECTION FEE

The Developer must pay the cost of inspection provided by the Department. Inspection cost for water and/or wastewater lines shall be as follows with added costs for special items of construction such as pump stations to be set by the System Superintendent.

- A. Water: \$1.25 per foot
- B. Wastewater-Gravity: \$2.00 per foot
- C. Wastewater-Force Main: \$1.50 per foot

Footage shall include main lines only. Service lines will not be included in the Inspection Fee computations. The computation shall be based on the lineal feet of approved water and/or wastewater lines to be constructed as taken from the approved plans. The total amount of the Inspection Fee shall be paid to the Department before issuance of the "Permit to Construct" can be made. The minimum Inspection Fee shall be \$1,000.00.

### 3.4.2 WORKMANSHIP

- A. The work shall at all times be subject to the inspection by authorized representatives of the Department. Materials and/or workmanship found not meeting requirements of approved plans and specifications shall be immediately brought into conformity with said plans and specifications.
- B. All water and/or wastewater construction shall be in accordance with the latest specifications of the City of Franklin Water and Wastewater Department.
- C. Contractor shall provide competent, suitably qualified personnel to survey, lay out and construct the work. Contractor shall at all times maintain good discipline and order at the site. Except as otherwise required for the safety or protection of persons, the work or property at the site or adjacent thereto, shall be performed during regular working hours. Regular working hours shall be considered to be 7:00 a.m. to 4:00 p.m., Monday through Friday. Contractor will not permit overtime work or the performance of work on Saturday, Sunday or any legal holiday without the Department's approval. A request to work outside regular working hours must be made two (2) working days prior to the time they propose to do this work.
- D. The Contractor shall be responsible for locating and verifying the elevations of existing utilities prior to construction.
- E. All grading work shall be completed and all roads constructed to subgrade and lot corners marked prior to the installation of water and/or wastewater lines.
- F. The Developer and his contractors shall protect all utilities whether existing or new from damage by other utility installers. The Developers shall replace any water service in its entirety, (for water lines from the main to the meter and for wastewater lines, from the main to the easement line/right-of-way) should it be damaged.
- G. Backfill requirements for utilities in proposed roads and adjacent to proposed roads must meet the requirements of the agency having jurisdiction of the roads upon completion of the project.
- H. All applicable Federal and state laws, municipal ordinances, the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the contract throughout.

### 3.4.3 JOBSITE SAFETY

Neither the professional activities of the Design Engineer, or the presence of his or her employees and subconsultants or the Department's personnel at a construction site, shall relieve the General Contractor and any other entity of their obligations, duties and responsibilities including, but not limited to, construction means, methods, sequence, techniques or procedures necessary for performing, superintending or coordinating all portions of the work of construction in accordance with the contract documents and any health or safety precautions required by any regulatory agencies. Neither the Design Engineer, the Department or their personnel have authority to exercise any control over any construction contractor or other entity or their employees in connection with their work or any health or safety precautions. The Department agrees that the Contractor is solely responsible for job-site safety. The Department also agrees that the Department, the Design Engineer, and the Design Engineer's consultants shall be indemnified and shall be made additional insured under the Contractor's general liability insurance policy.

### 3.5 FINAL INSPECTION

An authorized representative of the Department shall make a final inspection of the project after completion to determine acceptability of the work.

#### 3.5.1 SCHEDULING A FINAL INSPECTION

A. Before a final inspection is scheduled, the following must take place:

1. When the Developer completes the construction of lines, a semi-final inspection will be held by the Department and the Contractor. Upon completion of the "punch list" by the Contractor from this semi-final inspection, a final inspection with the Developer or his representative, the Contractor, and the Department will be held.
2. Binder pavement must be in place in road sections where water and/or wastewater lines are installed.
3. When the list of deficiencies, if any, are corrected, the Water Department will arrange for a final inspection.
4. The City at its discretion may require additional surveys by a licensed surveyor or engineer to verify placement of lines or other facilities within the easement.

### 3.5.2 ISSUANCE OF "CERTIFICATE OF ACCEPTANCE"

After all deficiencies have been corrected, a "Certificate of Acceptance" shall be issued to the Developer upon acceptance of the work by the City. The form shall be similar to that shown at the end of this General Information Section. A one year warranty period will begin upon the date of acceptance of the project by the Department.

### 3.6. ANNUAL INSPECTION

Approximately twelve (11) months following acceptance of the water project, a follow-up inspection will be made to determine if any failures/deficiencies have occurred as a direct result of the Contractor's work and/or materials. The Developer and/or Contractor will be responsible for correction of all failures/deficiencies that have occurred during the first year after acceptance.

### 3.7 RECORD DRAWINGS

#### 3.7.1 GENERAL REQUIREMENTS

- A. A record of all deviations from the construction plans shall be recorded in the field by the projects superintendent, and submitted to the Design Engineer who shall, upon completion of the project, generate Final Record Drawings. Final Record Drawings are generated by revising the original design information and adding the corrected data. Therefore, the Final Record Drawings will depict the constructed information.
- B. The Design Engineer shall provide a complete set of Record Drawings (including private developments) on moist erasable Cronaflex Mylar reproductions in reverse, and 3 sets of prints, and in digital format compatible with the City's geographic information system software, upon completion of construction, record drawings shall include actual field angles between lines, all actual service lines and meter locations. These record drawings must be completed and submitted prior to acceptance of any facilities into the public system and any connections being made thereto. The developer will furnish a recorded plat on Mylar to the Department immediately after the plat has been recorded. If available, the Developer is to submit all approved Drawings and final plats on computer disks, in an approved format.
- C. The completed Final Record Drawings shall be submitted to and reviewed by the Department for verification of information. The plans will be either accepted as Final Record Drawings or rejected and the above process is repeated. Final Record Drawings shall be approved by the City of Franklin before the releasing any Bonds held by the City.

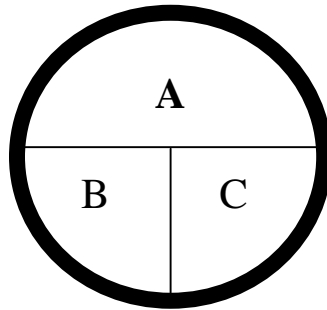


### 3.7.2 DRAWING INFORMATION

The drawings shall depict the Design Engineer's verification of the pipe sizes, location of fittings, valves, and hydrants tied to a minimum of 3 topographic features, as well as the horizontal and vertical locations of the water lines. Each Drawing shall have the following shown on each sheet.

- A. The Engineer shall stamp and sign **ALL SHEETS** of the Final Record Drawings (the Mylar set only).
- B. The Engineer shall affix a note on each sheet identifying the Drawings as Record Drawings.
- C. A statement affixed on the lower right-hand corner stating: I hereby certify that these construction drawings represent a true and accurate depiction of the as-built conditions.
- D. Any unverified data shall show +/-, thereby indicating that information has not been verified. This shall only apply to information that could not be field verified by reasonable methods as approved by the Field Representative.
- E. For Water Booster Stations, Wastewater Lift Stations and Water Storage Facilities
  - 1. All revisions in pipe sizes
  - 2. All revisions to electrical controls
  - 3. All revisions to ventilation systems
  - 4. Pump modifications
  - 5. Changes in elevation for level controls
  - 6. Equipment layout modifications
  - 7. Building modifications
  - 8. Location and elevation of existing utilities
- F. For Wastewater Lines
  - 1. All revisions in pipe sizes, lengths, slopes and angles
  - 2. Inverts (to the nearest hundredth)
  - 3. Manhole covers
  - 4. Flow Lines
  - 5. Changes in offset distances of structures
  - 6. Location and elevation of existing utilities

- G. Property Service Connections for sanitary wastewater laterals shall be shown as follows:



Whereas:

A = The horizontal distance from the center of the wye or tee to the center of the downstream manhole.

B = The horizontal distance from the center of the wye or tee to the end of the lateral.

C = The vertical distance from the top of the ground to the top of the lateral at the plug or property line.

### 3.8 STANDARDS FLEXIBILITY

#### Interpretations of These Standards and Design Criteria

Interpretations of these Standard Specifications or the determination of any other standards and design criteria not covered under these Standards shall be at the discretion of the Department. The decision of the Director shall be based on past practices, traditional policies, widely accepted professional principles and practices of the industry.



**PERMIT TO CONSTRUCT**

The City of Franklin, Tennessee, hereby grants permission to

\_\_\_\_\_, and  
(Project Developer)

\_\_\_\_\_,  
(Name of Contractor)

to construct certain water and wastewater facilities in accordance with drawings and specifications approved by the City of Franklin and the Tennessee Department of Environment and Conservation on \_\_\_\_\_.

The facilities to be constructed will serve \_\_\_\_\_

\_\_\_\_\_  
(Name of Proposed Development)

and construction will begin on or about \_\_\_\_\_. Construction involves approximately \_\_\_\_\_ L.F. of water/wastewater lines. The construction inspection fee deposit of \$ \_\_\_\_\_ has been paid.

The Contractor must have an approved set of drawings and specifications at the project site at all times. The project is subject to inspection by the City of Franklin at any time and items found deficient shall be immediately corrected. The project shall be subject to testing, final inspection and acceptance by the City of Franklin.

The Contractor and/or Developer shall be responsible for obtaining all other permits required by agencies and municipalities having jurisdiction.

**SPECIAL CONDITIONS**

---

---

---

---

Permit Issued by the  
City of Franklin, Williamson County, Tennessee

By \_\_\_\_\_ Date \_\_\_\_\_

**CERTIFICATE OF ACCEPTANCE**

**The City of Franklin, Tennessee, hereby accepts the following described water facilities as part of the public system of the City of Franklin:**

**(Name or Description of Development)** \_\_\_\_\_

\_\_\_\_\_  
**(Name of Owner)** \_\_\_\_\_

**(Description of Facilities)** \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
**(Value of Facilities)** \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
**Final inspection was conducted by the City of Franklin on \_\_\_\_\_,**  
**and facilities were found to be in accordance with approved drawings and**  
**specifications or approved modifications thereto. Record Drawings have been**  
**submitted to and approved by the Water and Wastewater Department.**

(Name of Developers) \_\_\_\_\_

\_\_\_\_\_

guarantees the workmanship and materials for a period of one (1) year from the date of acceptance specified below and will promptly repair any defect caused by faulty workmanship or materials occurring within the one-year guarantee period.

Dedicated By:

\_\_\_\_\_  
(Owner)

\_\_\_\_\_  
(Date)

Accepted By:

City of Franklin, Tennessee

By: \_\_\_\_\_

\_\_\_\_\_  
(Date)

**TABLE OF CONTENTS**

**CHAPTER 4**  
**TECHNICAL SPECIFICATIONS**

| <u>NO.</u> | <u>PARAGRAPH</u>                     | <u>PAGE</u> |
|------------|--------------------------------------|-------------|
|            | <b><u>EROSION CONTROL</u></b>        | 35          |
| 1.0        | GENERAL INFORMATION                  | 35          |
| 1.1        | Description                          | 35          |
| 2.0        | PRODUCTS                             | 35          |
| 2.1        | Temporary Berms                      | 35          |
| 2.2        | Temporary Slope Drains               | 35          |
| 2.3        | Sediment Structures                  | 35          |
| 2.4        | Check Dams                           | 35          |
| 2.5        | Temporary Seeding and Mulching       | 35          |
| 2.6        | Baled Hay or Straw Checks            | 35          |
| 2.7        | Temporary Silt Fences                | 35          |
| 3.0        | EXECUTION                            | 35          |
| 3.1        | Project Review                       | 36          |
| 3.2        | Pre-construction Conference          | 37          |
| 3.3        | Construction Requirements            | 38          |
| 3.4        | Construction of Structures           | 38          |
| 3.4.1      | Temporary Berms                      | 38          |
| 3.4.2      | Temporary Slope Drains               | 39          |
| 3.4.3      | Sediment Structures                  | 39          |
| 3.4.4      | Check Dams                           | 39          |
| 3.4.5      | Temporary Seeding and Mulching       | 40          |
| 3.4.6      | Baled Hay or Straw Erosion Checks    | 40          |
| 3.4.7      | Temporary Silt Fences                | 40          |
| 3.5        | Maintenance                          | 40          |
| 3.6        | Erosion Control Outside Project Area | 41          |



| <u>NO.</u> | <u>PARAGRAPH</u>   | <u>PAGE</u> |
|------------|--|-------------|
|            | <b><u>UNCLASSIFIED EXCAVATION FOR UTILITIES</u></b>                      | 42          |
| 1.0        | GENERAL INFORMATION  | 42          |
| 2.0        | PRODUCTS   | 42          |
| 3.0        | EXECUTION  | 42          |
| 3.1        | Preparation of the Site  | 42          |
| 3.2        | Unsuitable Materials   | 43          |
| 3.3        | Rocks and Boulders   | 43          |
| 3.4        | Disposal of Materials  | 44          |
| 3.5        | Excavation for Trenches, Manholes and Structures                         | 44          |
| 3.6        | Sheeting, Shoring and Bracing  | 46          |
| 3.7        | The Dewatering of Excavation   | 47          |
| 3.8        | Slopes   | 47          |
| 3.9        | Borrow Excavation  | 47          |
| 3.10       | Backfilling  | 48          |
| 3.11       | Maintenance  | 50          |
|            | <b><u>WATER LINES – PRESSURE PIPE</u></b>                                | 51          |
| 1.0        | GENERAL INFORMATION  | 51          |
| 2.0        | PRODUCTS   | 51          |
| 2.1        | Ductile Iron Pipe and Fittings   | 51          |
| 3.0        | EXECUTION  | 53          |
| 3.1        | Installation of Water Lines  | 53          |
| 3.2        | Hydrostatic Tests  | 55          |
| 3.3        | Disinfection   | 58          |
| 3.4        | Bacteriological Tests  | 60          |
| 3.5        | Disinfection Procedure After Cutting Into or Repairing<br>Existing Lines | 61          |
| 3.6        | Cleanup  | 62          |
|            | <b><u>VALVES, HYDRANTS AND BLOWOFFS</u></b>                              | 63          |
| 1.0        | GENERAL INFORMATION  | 63          |
| 2.0        | PRODUCTS   | 63          |

| <u>NO.</u> | <u>PARAGRAPH</u>                             | <u>PAGE</u> |
|------------|--|-------------|
| 2.1        | Gate Valves                                  | 63          |
| 2.2        | Tapping Sleeves for Ductile Iron Pipe        | 64          |
| 2.3        | Testing Tapping Sleeves                      | 64          |
| 2.4        | Tapping Valves - Resilient Seated Gate Valve | 64          |
| 2.5        | Butterfly Valves                             | 65          |
| 2.6        | Valve Boxes                                  | 66          |
| 2.7        | Fire Hydrants                                | 66          |
| 2.8        | Blow-Off Hydrant                             | 67          |
| 2.9        | Automatic Air Relief Valve                   | 67          |
| 3.0        | EXECUTION                                    | 67          |
| 3.1        | Setting Valves and Fittings                  | 67          |
| 3.2        | Setting Hydrants                             | 68          |
|            | <b><u>SERVICE ASSEMBLIES</u></b>             | 69          |
| 1.0        | GENERAL INFORMATION                          | 69          |
| 2.0        | PRODUCTS                                     | 69          |
| 2.1        | Service Assembly                             | 69          |
| 2.2        | Corporation Cock                             | 69          |
| 2.3        | Curb Stop                                    | 69          |
| 2.4        | Service Pipe                                 | 69          |
| 2.5        | Meter Boxes                                  | 69          |
| 2.6        | Meter Yokes                                  | 70          |
| 2.7        | Radio Read                                   | 70          |
| 3.0        | EXECUTION                                    | 70          |
|            | <b><u>WASTEWATER PIPE – GRAVITY</u></b>      | 72          |
| 1.0        | GENERAL INFORMATION                          | 72          |
| 2.0        | PRODUCTS                                     | 72          |
| 2.1        | Pipe   | 72          |
| 2.2        | Joints and Jointing Materials                | 73          |
| 2.3        | Valve Boxes                                  | 74          |
| 3.0        | EXECUTION                                    | 74          |
| 3.1        | Pipe Laying                                  | 74          |

| <u>NO.</u> | <u>PARAGRAPH</u>                                      | <u>PAGE</u> |
|------------|---|-------------|
| 3.2        | Testing of Gravity Sewers                             | 77          |
| 3.3        | Visual Inspection of Miscellaneous Materials          | 80          |
| 3.4        | Deflection Testing for PVC Pipe                       | 80          |
| 3.5        | Internal TV Inspection                                | 81          |
| 3.6        | Alternative Methods                                   | 81          |
| 3.7        | Cleanup   | 81          |
|            | <b><u>MANHOLES</u></b>                                | 82          |
| 1.0        | GENERAL INFORMATION                                   | 82          |
| 2.0        | PRODUCTS  | 82          |
| 2.1        | Concrete Masonry                                      | 82          |
| 2.2        | Casting Adjustment                                    | 82          |
| 2.3        | Mortar  | 82          |
| 2.4        | Gray Iron Castings                                    | 82          |
| 2.5        | Plastic Gasket for Pre-cast Manholes                  | 82          |
| 2.6        | Manhole Steps   | 83          |
| 2.7        | Pre-cast Manhole Components                           | 83          |
| 2.8        | Manhole Connectors                                    | 84          |
| 2.9        | Material Testing                                      | 84          |
| 3.0        | EXECUTION   | 84          |
|            | <b><u>WASTEWATER - FORCE MAIN</u></b>                 | 88          |
| 1.0        | GENERAL INFORMATION                                   | 88          |
| 2.0        | PRODUCTS  | 88          |
| 2.1        | Ductile Iron Pipe and Fittings                        | 88          |
| 2.2        | Detectable Tape                                       | 89          |
| 2.3        | Air Release Valves and Combination Air Release Valves | 89          |
| 3.0        | EXECUTION   | 90          |
| 3.1        | Installation of Force Main                            | 90          |
| 3.2        | Hydrostatic Tests                                     | 92          |
| 3.3        | Cleanup   | 94          |
|            | <b><u>PRESSURE WASTEWATER VALVES</u></b>              | 95          |
| 1.0        | GENERAL INFORMATION                                   | 95          |
| 2.0        | PRODUCTS  | 95          |

| <u>NO.</u> | <u>PARAGRAPH</u>                                    | <u>PAGE</u> |
|------------|---|-------------|
| 2.1        | Ball Valves   | 95          |
| 2.2        | Air Release Valves and Combination Air Valves       | 95          |
| 2.3        | Valve Boxes   | 95          |
| 3.0        | EXECUTION   | 95          |
| 3.1        | Location of Valves                                  | 95          |
| 3.2        | Valve Boxes and Valve Pits                          | 95          |
|            | <b><u>PREFABRICATED WASTEWATER PUMP STATION</u></b> | 97          |
| 1.0        | GENERAL INFORMATION                                 | 97          |
| 1.1        | Summary of Work                                     | 97          |
| 1.2        | Quality Assurance                                   | 97          |
| 1.3        | Submittals  | 98          |
| 1.4        | Warranty  | 100         |
| 2.0        | PRODUCTS  | 100         |
| 2.1        | General   | 100         |
| 2.2        | System Description                                  | 101         |
| 2.3        | Design Requirements                                 | 101         |
| 2.4        | Service and Capacity                                | 101         |
| 2.5        | System Components                                   | 102         |
| 2.6        | Motors  | 103         |
| 2.7        | Piping  | 103         |
| 2.8        | Instrumentation and Controls                        | 105         |
| 2.9        | Wiring  | 109         |
| 2.10       | Terminal Test Strip and Test Light                  | 109         |
| 2.11       | Protection Against Corrosion                        | 110         |
| 2.12       | Factory Test  | 110         |
| 3.0        | EXECUTION   | 110         |
| 3.1        | Technical Direction                                 | 110         |
| 3.2        | Spare Parts   | 110         |
|            | <b><u>CONCRETE FOR UTILITY LINES</u></b>            | 111         |
| 1.0        | GENERAL   | 111         |

| <u>NO.</u> | <u>PARAGRAPH</u>              | <u>PAGE</u> |
|------------|-------------------------------|-------------|
| 2.0        | PRODUCTS                      | 111         |
| 2.1        | Strength                      | 111         |
| 2.2        | Durability                    | 111         |
| 2.3        | Slump                         | 111         |
| 2.4        | Admixtures                    | 111         |
| 2.5        | Reinforcing Steel             | 111         |
|            | <b><u>SEEDING</u></b>         | 112         |
| 1.0        | GENERAL INFORMATION           | 112         |
| 2.0        | PRODUCTS                      | 112         |
| 2.1        | Grass Seed                    | 112         |
| 2.2        | Fertilizer                    | 112         |
| 2.3        | Agricultural Limestone        | 112         |
| 2.4        | Mulch                         | 112         |
| 3.0        | EXECUTION                     | 113         |
| 4.0        | INSPECTIONS                   | 114         |
| 5.0        | GUARANTEE                     | 114         |
|            | <b><u>SODDING</u></b>         | 115         |
| 1.0        | GENERAL INFORMATION           | 115         |
| 2.0        | PRODUCTS                      | 115         |
| 2.1        | Sod                           | 115         |
| 2.2        | Fertilizer                    | 115         |
| 2.3        | Agriculture Limestone         | 116         |
| 3.0        | EXECUTION                     | 116         |
| 4.0        | INSPECTIONS                   | 116         |
| 5.0        | GUARANTEES                    | 117         |
|            | <b><u>PAVEMENT REPAIR</u></b> | 118         |
| 1.0        | GENERAL INFORMATION           | 118         |

| <u>NO.</u> | <u>PARAGRAPH</u>                | <u>PAGE</u> |
|------------|---------------------------------|-------------|
| 2.0        | PRODUCTS                        | 118         |
| 2.1        | Mineral Aggregate Base          | 118         |
| 2.2        | Bituminous Prime Coats          | 119         |
| 2.3        | Crushed Stone Chips             | 119         |
| 2.4        | Double Bituminous Surface       | 119         |
| 2.5        | Asphaltic Concrete Binder       | 119         |
| 2.6        | Bituminous Tack Coat            | 119         |
| 2.7        | Asphaltic Concrete Surface      | 119         |
| 2.8        | Quick Dry Traffic Marking Paint | 119         |
| 3.0        | EXECUTION                       | 119         |
| 3.1        | Subgrade                        |             |
| 3.2        | Base                            | 119         |
| 3.3        | Seal Coat Surface               | 120         |
| 3.4        | Double Bituminous Surface       | 120         |
| 3.5        | Asphaltic Concrete Binder       | 120         |
| 3.6        | Asphaltic Concrete Surface      | 121         |
| 3.7        | Smoothness                      | 121         |
| 3.8        | Sampling and Testing            | 121         |

## CHAPTER 4

### EROSION CONTROL

#### PART 1 GENERAL INFORMATION

##### 1.1 DESCRIPTION

- 1.1.1 This work shall consist of erosion control on all cut and fill operations, excavation, backfill, or other construction activities within the limits of the construction site, within any temporary or permanent easements, and within any borrow site used during the period of construction. The protection of these sites shall continue throughout the construction period. During flood seasons, protect the sites by sandbagging, the pumping of water, and any other means appropriate to restrain flooding of plant and equipment. During dry weather, sprinkle the sites with water or use other means as necessary to provide dust control. In case of abnormally cold weather, any construction such as excavation work may be delayed until warmer weather or covered to prevent freezing.
- 1.1.2 The temporary pollution control provisions contained herein shall be coordinated with the permanent erosion control features, to ensure economical, effective, and continuous erosion control throughout the construction and post-construction period.
- 1.1.3 It is the intent of this section to provide a written description of acceptable methods to ensure that PL 100-4, Section 319, TCA 69-3-101, et. seq., Subsection 69-3-108 and Subsection 69-3-114, and Division of Environment and Conservation General Permit for Utility Line Crossings of Streams, Chapter 1200-4-7.08 are met. Also the proposed work shall meet Section 11-223 of Chapter 2 of Title 11 of the Franklin Municipal Code; Erosion and Sedimentation Control Regulations. Since the Contractor is responsible for the construction means and methods which in turn are responsible for ensuring that construction does not harm the Waters of Tennessee, the Contractor is solely responsible for ensuring that all federal, state and local laws and regulations are met.

#### PART 2 PRODUCTS

##### 2.1 TEMPORARY BERMS

- 2.1.1 A temporary berm is constructed of compacted soil, with or without a shallow ditch, at the top of fill slopes or transverse to centerline on fills.

- 2.1.2 These berms are used temporarily at the top of newly constructed slopes to prevent excessive erosion until permanent controls are installed or slopes stabilized.
- 2.2 **TEMPORARY SLOPE DRAINS:** A temporary slope drain is a facility consisting of stone gutters, fiber mats, plastic sheets, concrete or asphalt gutters, half round pipe, metal pipe, plastic pipe, sod, or other material that may be used to carry water down slopes to reduce erosion.
- 2.3 **SEDIMENT STRUCTURES:** Sediment basins, ponds, and traps, are prepared storage areas constructed to trap and store sediment from erodible areas in order to protect properties and stream channels below the construction areas from excessive siltation.
- 2.4 **CHECK DAMS:** Check dams are barriers composed of large stones, sandbags, or other noncorrodible materials placed across or partially crossing a natural or constructed drain way.
- 2.5 **TEMPORARY SEEDING AND MULCHING:** Temporary seeding and mulching are measures consisting of seeding, mulching, fertilizing, and matting utilized to reduce erosion. All cut and fill slopes including waste sites and borrow pits shall be seeded when and where necessary to eliminate erosion.
- 2.6 **BALED HAY OR STRAW CHECKS**
- 2.6.1 Baled hay or straw erosion checks are temporary measures to control erosion and prevent siltation. Bales shall be either hay or straw containing 5 cubic feet or more of material.
- 2.6.2 Baled hay or straw checks shall be used where the existing ground slopes toward or away from the embankment along the toe of slopes, in ditches, or other areas where siltation, erosion or water runoff is a problem.
- 2.7 **TEMPORARY SILT FENCES:** Silt fences are temporary measures utilizing woven wire or other approved material attached to posts with filter cloth composed of burlap, plastic filter fabric, etc., attached to the upstream side of the fence to retain the suspended silt particles in the runoff water.

## PART 3 EXECUTION

### 3.1 **PROJECT REVIEW:**

- 3.1.1 Prior to the preconstruction conference the Contractor shall meet with the Design Engineer and go over in detail the expected problem areas in regard to the erosion control work. Different solutions should be discussed so that the best method of erosion control might be determined. It is the basic



responsibility of the Contractor to develop an erosion control plan acceptable to the City of Franklin.

3.1.2 The project drawings show the minimum erosion and siltation control measures required for this job. If the Contractor desires to stockpile construction materials, stone, earth, etc., the location of same and protection thereof shall be outlined in the Erosion and Siltation Control Plan to be submitted to the City of Franklin for review.

3.1.3 The Contractor shall submit a spill prevention plan to the City of Franklin for review. The contents of this spill prevention plan shall depend on the types of chemicals, lubricants and fuels to be used and if these will be stored on site. As a minimum, if no fuel or lubricants or other chemicals are stored on site, either temporarily in vehicular tanks or in skid or trailer mounted tanks, a plan shall be supplied which directs all employees of the Contractor in the proper procedures to be followed should a spill occur. For more complex chemical storage requirements, a more complex plan will be required.

3.2 **PRECONSTRUCTION CONFERENCE:** At the preconstruction conference, the Contractor shall submit for acceptance, his schedule for accomplishment of temporary and permanent erosion control work, as is applicable for clearing and grubbing, grading, bridges, and other structures at watercourses, construction, and paving. He shall also submit for acceptance his proposed method of erosion control on haul roads and borrow pits and his plan for disposal of waste materials. No work shall be started until the erosion control schedules and methods of operations have been accepted by the City of Franklin.

### 3.3 **CONSTRUCTION REQUIREMENTS**

3.3.1 The City of Franklin has the authority to limit the surface area of erodible earth material exposed by clearing and grubbing, the surface of erodible earth material exposed by excavation, borrow and fill operations and to direct the Contractor to provide immediate permanent or temporary pollution control measures to prevent contamination of adjacent streams or other watercourses, lakes, ponds, or other water impoundment. Such work may involve the construction of temporary berms, dikes, dams, sediment basins, slope drains, and use of temporary mulches, mats, seeding or other control devices or methods as necessary to control erosion. Cut and fill slopes shall be seeded and mulched as the excavation proceeds to the extent as shown in the approved Erosion and Siltation Control Plan.

3.3.2 The Contractor shall be required to incorporate all permanent erosion control features into the project at the earliest practicable time as outlined in his accepted schedule. Temporary pollution control measures shall be used to correct conditions that develop during construction that were not foreseen

during the preconstruction stage; that are needed prior to installation of permanent pollution control features; or that are needed temporarily to control erosion that develops during normal construction practices, but are not associated with permanent control features on the project.

- 3.3.3 Where erosion is likely to be a problem, clearing and grubbing operations should be so scheduled and performed that grading operations and permanent erosion control features can follow immediately thereafter if the project conditions permit; otherwise erosion control measures may be required between successive construction stages. Under no conditions shall the surface area of erodible earth material exposed at one time by clearing and grubbing, exceed 5ac= (217,800 square feet) without written approval of the City of Franklin.
- 3.3.4 The Contractor will limit the area of excavation, borrow, and embankment operations in progress commensurate with the Contractor's capability and progress in keeping the finish grading, mulching, seeding, and other such permanent pollution control measures current in accordance with the accepted schedule. Should seasonal limitations make such coordination unrealistic, temporary erosion control measures shall be taken immediately to the extent feasible and justified.
- 3.3.5 In the event of conflict between these requirements and pollution control laws, rules or regulations, or other Federal, State, or Local agencies, the more restrictive laws, rules, or regulations shall apply.
- 3.3.6 Under no circumstances will spent oil wastes be discharged anywhere on the site without the expressed written consent of the Tennessee Office of Water Management.

### 3.4 **CONSTRUCTION OF STRUCTURES**

#### 3.4.1 Temporary Berms

- 3.4.1.1 A temporary berm shall be constructed at the top of fill slopes or transverse to centerline on fills. The temporary berm shall be constructed of compacted soil, with a minimum width of 24 inches at the top and a minimum height of 12 inches with or without a shallow ditch. Temporary berms shall be graded so as to drain to a compacted outlet at a slope drain. The area adjacent to the temporary berm in the vicinity of the slope drain must be properly graded to enable this inlet to function efficiently and with only minimum ponding in this area. All transverse berms required on the downstream side of a slope drain shall extend across the grade to the highest point at approximately a 10 degree angle with a perpendicular to centerline. The top width of these berms may be wider and the side slope flatter on transverse berms to allow equipment to pass over these berms with minimal disruptions. When practical

and until final roadway elevations are approached, embankments should be constructed with a gradual slope to one side of the embankment to permit the placement of temporary berms and slope drains on only one side of the embankment.

### 3.4.2 Temporary Slope Drains

3.4.2.1 Temporary slope drains shall consist of stone gutters, fiber mats, plastic sheets, concrete or asphalt gutters, half round pipe, metal pipe, plastic pipe, flexible rubber, or other materials which can be used as temporary measures to carry water accumulating in the cuts and on the fills down the slopes prior to installation of permanent facilities or growth of adequate ground cover on the slopes.

3.4.2.2 Fiber matting and plastic sheeting shall not be used on slopes steeper than 4:1 except for short distances of 20 feet or less.

3.4.2.3 All temporary slope drains shall be adequately anchored to the slope to prevent disruption by the force of the water flowing in the drains. The base for temporary slope drains shall be compacted and concavely formed to channel the water or hold the slope drain in place. The inlet end shall be properly constructed to channel water into the temporary slope drain. Energy dissipaters, sediment basins, or other approved devices shall be constructed at the outlet end of the slope drains to reduce erosion downstream. An ideal dissipater would be dumped rock or a small sediment basin which would slow the water as well as pick up some sediment. All temporary slope drains shall be removed when no longer necessary and the site restored to match the surroundings.

### 3.4.3 Sediment Structures

3.4.3.1 Sediment structures shall be utilized to control sediment at the foot of embankments where slope drains outlet; at the bottom as well as in the ditch lines atop waste sites; in the ditch lines or borrow pits. Sediment structures may be used in most drainage situations to prevent excessive siltation of pipe structures. All sediment structures shall be at least twice as long as they are wide.

3.4.3.2 When use of temporary sediment structures is to be discontinued, all sediment accumulation shall be removed, and all excavation backfilled and properly compacted. The existing ground shall be restored to its natural or intended condition.

### 3.4.4 Check Dams

- 3.4.4.1 Check dams shall be utilized to retard stream flow or restrict stream flow within the channel. Materials utilized to construct check dams are varied and should be clearly illustrated or explained in the Contractor's erosion control plan.
- 3.4.4.2 All check dams shall be keyed into the sides and bottom of the channel.
- 3.4.5 Temporary Seeding and Mulching
  - 3.4.5.1 Seeding and mulching shall be performed in accordance with the Section 02485, Seeding.
- 3.4.6 Baled Hay or Straw Erosion Checks
  - 3.4.6.1 Hay or straw erosion checks shall be embedded in the ground 4 to 6 inches to prevent water flowing under them. The bales shall also be anchored securely to the ground by wooden stakes driven through the bales into the ground. Bales can remain in place until they rot, or be removed after they have served their purpose, as determined by the City of Franklin. The Contractor shall keep the checks in good condition by replacing broken or damaged bales immediately after damage occurs. Normal debris cleanout will be considered routine maintenance.
- 3.4.7 Temporary Silt Fences
  - 3.4.7.1 Temporary silt fences shall be placed on the natural ground, at the bottom of fill slopes, in ditches, or other areas where siltation is a problem. Silt fences are constructed of wire mesh fence with a covering of burlap or some other suitable material on the upper grade side of the fence and anchored into the soil.
  - 3.4.7.2 The Contractor shall be required to maintain the silt fence in a satisfactory condition for the duration of the project or until its removal is requested by the City of Franklin. The silt accumulation at the fence may be left in place and seeded, removed, etc., as directed by the City of Franklin. The silt fence becomes the property of the Contractor whenever the fence is removed.
- 3.5 **MAINTENANCE**
  - 3.5.1 The temporary erosion control features installed by the Contractor shall be acceptably maintained by the Contractor until no longer needed or permanent erosion control methods are installed. Any materials removed shall become the property of the Contractor.

**3.6 EROSION CONTROL OUTSIDE PROJECT AREA**

- 3.6.1 Temporary pollution control shall include construction work outside the project area where such work is necessary as a result of construction such as borrow pit operations, haul roads, and equipment storage sites.

END OF SECTION

## CHAPTER 4

### UNCLASSIFIED EXCAVATION FOR UTILITIES

#### PART 1 GENERAL INFORMATION

- 1.1 The work called for by this section shall consist of clearing and grubbing, loosening, loading, removing, and disposing of, in the specified manner, all wet and dry materials (including rock) encountered that must be removed for construction purposes; furnishing, placing, and maintaining all sheeting, shoring, bracing, and timbering necessary for the proper protection and safety of the work, the workmen, the public, and adjacent property and improvements; the dewatering of trenches and other excavations; the preparation of satisfactory pipe beds; the backfilling and tamping of trenches, foundations, and other structures; the preparation of fills and embankments; the removal of unsuitable material from outside the normal limits of excavation and, where ordered by the designing A/E or the water department, their replacement with suitable materials; and all other grading or excavation work incidental to or necessary for the work. This work shall be performed as specified below.

#### PART 2 PRODUCTS

NOT USED

#### PART 3 EXECUTION

##### 3.1 **PREPARATION OF THE SITE**

- 3.1.1. Before starting construction, remove from the work site all vegetable growth (except as hereinafter excluded), debris, and/or other objectionable matter as well as any buildings and/or other structures that the drawings and/or the Design Engineer specifically indicate are to be removed. Dispose of this refuse material in an approved manner by the City of Franklin.
- 3.1.2 Take reasonable care during construction to avoid damage to vegetation. Where the area to be excavated is occupied by trees, brush, or other uncultivated vegetable growth, clear such growth from the area, and dispose of it in a satisfactory manner. Leave undisturbed any trees, cultivated shrubs, flowers, etc., situated within public rights-of-way and/or easements through private property but not located directly within excavation limits. Transplant small ornamental trees, cultivated shrubs, flowers, etc., located directly within excavation limits so they may be replaced during property restoration operations. Do not remove or disturb any tree larger than six (6) inches in

diameter without the written permission of the Design Engineer on work performed by a Developer on property owned by the Developer or by the Department on work performed under contract to the City of Franklin. Take special precautions (including the provision of barricades and the temporary tying back of shrubbery and tree branches) for the protection and preservation of such objects throughout all stages of construction; the Contractor will be held liable for any damage that may result to said objects from excavation or construction operations. Trim any limbs or branches of trees broken during construction operations with a clean cut, and paint with an approved tree pruning compound. Treat tree trunks receiving damage from equipment with a tree dressing. All tree removal shall meet the City of Franklin Codes Regulations governing tree removal

- 3.1.3 If the area to be excavated is occupied by trees, brush, or other vegetable growth, clear such growth and grub the excavated area, and remove all large roots to a depth of not less than 2 feet below the bottom of the proposed construction. Dispose of the growth removed in a manner satisfactory to the Design Engineer. Fill all holes or cavities created during this work that extend below the subgrade elevation with suitable material, and compact to the same density as the surrounding material.

- 3.1.4 The preparation of the site shall be considered an incidental part of the excavation work.

### 3.2 **UNSUITABLE MATERIALS**

- 3.2.1 Wherever muck, quicksand, soft clay, swampy ground, or other material unsuitable for foundations, subgrade, or backfilling is encountered, remove it and continue excavation until suitable material is encountered. The material removed shall be disposed of in the manner described below. Then refill the areas excavated for this reason with 1 inch to 2 inch crushed stone up to the level of the lines, grades, and/or cross sections shown on the drawings. The top 6 inches of this refill shall be 1/2 inch to 3/4 inch crushed stone (TDOT #57) for bedding.

### 3.3 **ROCKS AND BOULDERS**

- 3.3.1 Any material that is encountered within the limits of the required excavation that cannot be removed except by drilling and/or blasting, including rock, boulders, masonry, hard pan, chert, shale, street and sidewalk pavements, and/or similar materials, shall be considered as unclassified excavation.
- 3.3.2 Should rock be encountered in the excavation, remove it by blasting or otherwise. Where blasts are made, cover the excavation with enough excavation material and/or timber or steel matting to prevent danger to life and property. The Contractor shall secure, at his own expense, all permits

required by law for blasting operations and the additional hazard insurance required. Observe all applicable laws and ordinances pertaining to blasting operations.

3.3.3 Excavate rock over the horizontal limits of excavation and to a depth of not less than 6 inches below the bottom of pipe up to 30 inches in diameter and not less than 12 inches below the bottom of larger pipes if rock extends to such depth. Then backfill the space below grade with 1/2 inch to 3/4 inch (TDOT #57) crushed stone or other approved material, tamp to the proper grade, and make ready for construction.

3.3.4 The removal of rocks and boulders shall be considered an incidental part of the excavation work.

### 3.4 **DISPOSAL OF MATERIALS**

3.4.1 Whenever practicable, all materials removed by excavation that are suitable for backfilling pipe trenches or for other purposes shown on the drawings or directed by the designing A/E or the water department shall be used for these purposes. Any materials not so used shall be considered waste materials and disposed of by the Contractor as specified below.

3.4.2 Waste materials may be deposited in spoil areas at approved locations. Do not leave in unsightly piles but instead spread in uniform layers, neatly level, and shape to drain. Seed as specified in Section 02485, Seeding.

3.4.3 Once any part of the work is completed, properly dispose of all surplus or unused materials (including waste materials) left within the construction limits of that work. Leave the surface of the work in a neat and workmanlike condition, as described below.

3.4.4 The disposal of waste materials shall be considered an incidental part of the excavation work.

### 3.5 **EXCAVATION FOR TRENCHES, MANHOLES, AND STRUCTURES**

3.5.1 Unclassified excavation for pipelines shall consist of the excavation necessary for the construction of water, wastewater, and other pipes and their appurtenances (including manholes, inlets, outlets, headwalls, collars, concrete saddles, and pipe protection) that are called for by the drawings. It shall include clearing and grubbing where necessary, backfilling and tamping pipe trenches and around structures, and disposing of waste materials, all of which shall conform to the applicable provisions set forth elsewhere in these specifications.



- 3.5.2 Unless the construction of lines by tunneling, jacking, or boring is called for by the drawings, make excavation for pipelines in open cut and true to the lines and grades shown on the drawings or established by the Developer's designing A/E based on actual ground information. From the bottom of the trench to 1-foot above the top of the pipe cut the bank of trenches between vertical parallel planes equidistant from the pipe centerline. The horizontal distance between the vertical planes (or, if sheeting is used, between the inside faces of the sheeting) shall vary with the size of the pipe to be installed, but shall be a minimum of 8 inches and a maximum of 12 inches on each side of the pipe. Any cut made in excess of 12 inches on both sides of the pipe may be cause for the City of Franklin to require stronger pipe and/or a higher class of bedding. From a distance of 1-foot above the top of the pipe to the surface of the ground, comply with all OSHA standards.
- 3.5.3 Shape the bottom of all trenches to provide uniform bearing for the bottom of the pipe barrel. For all gravity wastewater lines, provide a minimum of 6 inches or 1/2 inch to 3/4 inch crushed stone for bedding.
- 3.5.4 Excavate bell holes for bell and spigot pipe at proper intervals so that the barrel of the pipe will rest for its entire length upon the bottom of the trench. Bell holes shall be large enough to permit proper jointing of the pipe. Do not excavate bell holes more than 2 joints ahead of pipe laying.
- 3.5.5 Excavation for manholes, inlets, and other incidental structures shall not be greater in horizontal area than that required to allow a 2-foot clearance between the outer surface of the structure and the walls of the adjacent excavation or of the sheeting used to protect it. The bottom of the excavation shall be true to the required shape and elevation shown on the drawings. No earth backfilling will be permitted under manholes, inlets, headwalls, or similar structures. Should the Contractor excavate below the elevations shown or specified, he shall, at his own expense, fill the void with either concrete or clean 1/2-inch to 3/4-inch crushed stone (TDOT #57).
- 3.5.6 Do not excavate pipe trenches more than 200 feet ahead of the pipe laying, and perform all work so as to cause the least possible inconvenience to the public. Construct temporary bridges or crossings when and where necessary to maintain vehicular or pedestrian traffic.
- 3.5.7 In all cases where materials are deposited along open trenches, place them so that in the event of rain no damage will result to the work and/or to adjacent property.
- 3.5.8 Excavation for manholes and other structures may be performed with nonvertical banks except beneath pavements or adjoining existing improvements. Do not permit the horizontal area of the excavation to exceed that required to allow a 2-foot clearance between the outer surface of the

structure and the banks of the excavation or the sheeting used to protect the embankments. The bottom of the excavation shall be true to the required shape and elevation shown on the Drawings.

- 3.5.9 Excavation for trenches, manholes and structures shall be considered an integral part of the installation of water lines and its appurtenances.

### 3.6 **SHEETING, SHORING, AND BRACING**

- 3.6.1 Take special care to avoid damage wherever excavation is being done. Sufficiently sheet, shore, and brace the sides of all excavations to prevent slides, cave-ins, settlement, or movement of the banks and to maintain the specified trench widths. Use solid sheets in wet, saturated, or flowing ground. All sheeting, shoring, and bracing shall have enough strength and rigidity to with-stand the pressures exerted, to keep the walls of the excavation properly in place, and to protect all persons and property from injury or damage.
- 3.6.2 Wherever employees may be exposed to moving ground or cave-ins, shore and lay back exposed earth excavation surfaces more than 4 feet high to a stable slope, or else provide some equivalent means of protection. Effectively protect trenches less than 4 feet deep when examination of the ground indicates hazardous ground movement maybe expected. Guard the walls and faces of all excavations in which employees are exposed to danger from moving ground by a shoring system, sloping of the ground, or some equivalent protection.
- 3.6.3 Comply with all OSHA standards in determining where and in what manner sheeting, shoring, and bracing are to be done.
- 3.6.4 Where excavations are made adjacent to existing buildings or structures or in paved streets or alleys, take particular care to sheet, shore, and brace the sides of the excavation so as to prevent any undermining of or settlement beneath such structures or pavement. Underpin adjacent structures wherever necessary, with the approval of the Design Engineer.
- 3.6.5 Do not leave sheeting, shoring, or bracing materials in place unless this is called for by the drawings, ordered by the Design Engineer or the water department, or deemed necessary or advisable for the safety or protection of the new or existing work or features. Remove these materials in such a manner that the new structure or any existing structures or property, whether public or private, will not be endangered or damaged and that cave-ins and slides are avoided.
- 3.6.6 Fill and compact all holes and voids left in the work by the removal of sheeting, shoring, or bracing as specified herein.

3.6.7 The Contractor may use a trench box, which is a prefabricated movable trench shield composed of steel plates welded to a heavy steel frame. The trench box shall be designed to provide protection equal to or greater than that of an appropriate shoring system.

3.6.8 Sheet piling, shoring, bracing and the use of trench boxes during the construction shall be considered an incidental part of the work.

### 3.7 **THE DEWATERING OF EXCAVATION**

3.7.1 Provide and keep in operation enough suitable pumping equipment whenever necessary or whenever directed to do so by the City of Franklin or the water department. Give special attention to excavations for those structures that, prior to proper backfilling, are subject to flotation from hydrostatic uplift.

3.7.2 Dewatering and the equipment required for the removal of ground water shall be considered incidental to the work.

### 3.8 **SLOPES**

3.8.1 Neatly trim all open cut slopes, and finish to conform either with the slope lines shown on the drawings or the directions of the Design Engineer. Leave the finished surfaces of bottom and sides in reasonably smooth and uniform planes like those normally obtainable with hand tools, though the Contractor will not be required to use hand methods if he is able to obtain the required degree of evenness with mechanical equipment. Conduct grading operations so that material is not removed or loosened beyond the required slope.

### 3.9 **BORROW EXCAVATION**

3.9.1 Whenever the backfill of excavated areas or the placement of embankments requires more material than is available from authorized excavations, or whenever the backfill material from such excavations is unsuitable, then obtain additional material from other sources. This may require the opening of borrow pits at points accessible to the work. In such cases, make suitable arrangements with the property owner and pay all incidental costs, including any royalties, for the use of the borrowed material. Before a borrow pit is opened, the quality and suitability of its material shall be approved by the Design Engineer.

3.9.2 Excavate borrow pits in such a way that the remaining surfaces and slopes are reasonably smooth and that adequate drainage is provided over the entire area. Construct drainage ditches wherever necessary to provide outlets for water to the nearest natural channel, thus preventing the formation of pools in the pit area. Leave the sides of borrow pit cuts at a maximum slope of 2:1 unless otherwise directed by the Design Engineer.

3.9.3 Properly clear and grub borrow pits, and remove all objectionable matter from the borrow pit material before placing it in the backfill.

3.9.4 The taking of materials from borrow pits for use in the construction of backfill, fills, or embankments shall be considered an incidental part of the work.

### 3.10 **BACKFILLING**

3.10.1 Begin backfilling after the line construction is completed and then inspected and approved by the City of Franklin. For water lines, begin backfilling after the line construction is completed and then inspected and approved by the Field Representative. On each side of the line, from the bottom of barrel to 1 foot above the top of the pipe, the backfill material shall consist of clean 1/2 inch to 3/4 inch crushed stone (TDOT #57). For waterlines, on each side of the line, from the bottom of barrel to 1-foot above the top of the pipe, the backfill material shall consist either of fine, loose earth like sandy soil or loam or of granular material that is free from clods, vegetable matter, debris, stone, and/or other objectionable materials that has a size of no more than 2 inches. Place this backfill simultaneously on either side of the pipe in even layers that before compaction are no more than 6 inches deep. Thoroughly and completely tamp each layer into place before placing additional layers. At locations beneath or closely adjacent to existing pavement and new or proposed roadways this backfill shall consist of clean 1/2-inch to 3/4-inch crushed stone (TDOT #57) properly consolidated. Backfill in proposed streets shall meet the requirements of The City of Franklin, or Williamson County Highway Department as applicable.

3.10.2 From 1 foot to 2 feet above the top of the pipe use backfill material consisting of earth or granular material with individual stones not exceeding 2 inches in diameter.

3.10.3 From 2 feet above the pipe upward, the backfill material may contain broken stones that make up approximately 3/4 of the backfill's total volume. However, if this type of backfill is used, there must be enough spalls and earth materials to fill all voids completely. The maximum dimension of individual stones in such backfill shall not exceed 6 inches, and the backfill material shall be placed and spread in even layers not more than 12 inches deep. At locations beneath or closely adjacent to existing pavement, new or proposed roadways, or at locations of improvements subject to damage by displacement, backfill material shall consist of clean 1/2-inch to 3/4-inch crushed stone (TDOT #57) properly consolidated. In other areas, including areas beneath or closely adjacent to proposed pavement, the backfill for the upper portion of the trenches may be placed without tamping, but shall be compacted to a density equivalent to that of adjacent earth material as

determined by laboratory tests. Use special care to prevent the operation of backfilling equipment from causing any damage to the pipe.

- 3.10.4 If earth material for backfill is too dry to allow thorough compaction, then add enough water so that the backfill can be properly compacted. Do not place earth backfill material that is too wet or otherwise unsuitable.
- 3.10.5 Wherever excavation has been made within easements across private property, the top 1-foot of backfill material shall consist of fine loose earth free from large clods, vegetable matter, debris, stone, and/or other objectionable materials.
- 3.10.6 Wherever trenches have been cut across or along existing pavement, temporarily pave the backfill of such trenches by placing 12 inches of Class A, Grade D, crushed stone and 3 inches of cold mix at the top of the backfill. Maintain this temporary pavement either until the permanent pavement is restored or until the project is accepted by the water department.
- 3.10.7 Conduct backfilling around manholes, inlets, outfalls, and/or structures in the same manner as specified above for pipelines except that even greater care is necessary to prevent damage to the utility structure.
- 3.10.8 Wherever pipes have diameters of 15 inches or less, do not use power operated tampers to tamp that portion of the backfill around the pipe within 1-foot above the pipe.
- 3.10.9 Perform backfilling so as not to disturb or injure any pipe and/or structure against which the backfill is being placed. If any pipe or structure is damaged and/or displaced during backfilling, open up the backfill and make repairs as necessary.
- 3.10.10 Check dams shall be installed in the bedding and backfill of all new or replaced wastewater lines to limit the drainage area subject to the french drain effect of gravel bedding. Dams shall consist of compacted clay bedding and backfill at least three (3) feet thick to the top of the trench and cut into the walls of the trench two (2) feet. Alternatively, concrete may be used, keyed in to the trench walls. Dams shall be placed no more than 500 feet apart. The stream crossings will include check dams on both sides of the crossing.
- 3.10.11 Backfilling and clean-up operations shall closely follow pipe laying; failure to comply with this provision will result in the water department requiring that the Contractor's other activities be suspended until backfilling and clean-up operations catch up with pipe laying.
- 3.10.12 Backfilling of trenches, manholes, and structures shall be considered an integral part of the installation of water lines and its appurtenances.

### **3.11 MAINTENANCE**

- 3.11.1 Seed and maintain in good condition all excavated areas, trenches, fills, embankments, and channels until final acceptance by the water department.
- 3.11.2 Maintain trench backfill at the approximate level of the original ground surface by periodically adding backfill material wherever necessary and whenever directed to do so by the City of Franklin. Continue such maintenance until one year after final acceptance of the project, or until the Water Department issues a written release.
- 3.11.3 Maintenance shall be considered an incidental part of the work.
- 3.11.4 Use of trench boxes shall not prevent the need to provide backfill material from trench wall to trench wall. Backfill material shall be placed in void outside of trench box and maintain proper compaction and height upon removal of trench box.

END OF SECTION

## CHAPTER 4

### WATER LINES – PRESSURE PIPE

#### PART 1 GENERAL INFORMATION

- 1.1 Furnish all material, equipment, tools, and labor in connection with the water lines, complete and in accordance with the drawings and these specifications. Pipe material shall be ductile iron.
- 1.2 It shall be the Contractor's responsibility to ensure that all necessary materials are furnished to him and that those found to be defective in manufacture are replaced at no extra cost to the Owner. Materials damaged in handling after being delivered by the manufacturer shall be replaced at the Contractor's own expense. If installed material is found to be defective, the cost of both the material and labor needed to replace it shall be borne by the Contractor.
- 1.3 The Contractor shall be responsible for safely storing materials needed for the work which have been accepted by him. Keep the interior of all pipes, fittings, and other accessories, free from dirt and foreign matter at all times.
- 1.4 Refer to other sections for work related to that specified by this section. Coordinate this work with that required by other sections for timely execution.

#### PART 2 PRODUCTS

##### 2.1 **DUCTILE IRON PIPE AND FITTINGS**

- 2.1.1 Ductile iron pipe shall conform to the requirements of ANSI 21.51/AWWA C151 for ductile iron pipe centrifugally cast in metal or sand-lined molds. It shall be made and tested in accordance with ASTM A536 and be subjected to and able to withstand a hydrostatic pressure of 500 psi. The minimum size shall be 6 inches, unless otherwise approved by the Water Department.
- 2.1.2 The pipe shall be plain end ductile iron pipe with push-on, single gasket joints. The design thickness shall be that specified by ANSI A21.50/AWWA C150 except that all pipe with a diameter of 12 inches or less shall be of a pressure Class 350 and all pipe with a diameter of 14 inches to 36 inches shall be of pressure of Class 300 unless determined otherwise by the Water Department. Pipe larger than 36 inches shall be designed on an individual basis.

- 2.1.3 The length of each individual piece of ductile iron pipe shipped must be plainly marked on that piece of pipe.
- 2.1.4 The push-on single gasket joints shall be either "Fastite" (by American Cast Iron Pipe Company); "Tyton" (by U.S. Pipe and Foundry Company), or "Super Bell-Tite" (by Clow Corporation, McWane, or Griffin).
- 2.1.5 The bell of each pipe shall have a tapered annular opening and a cast or machined retaining groove for the gasket. The gasket groove shall have a flared design so that maximum deflection will be provided. The plain spigot end of the pipe shall be beveled in order to simplify its entry into and centering within the bell and the compression of the gasket.
- 2.1.6 The gasket shall be of high quality vulcanized rubber made in the form of a solid ring to exact dimensions. The design of the gasket groove in the bell of the pipe and the design, hardness, and other properties of the gasket itself shall be such that the joint is liquidtight for all pressures from a vacuum to a maximum rating of 350 psi of internal liquid pressure.
- 2.1.7 Enough lubricant shall be furnished with each order to provide for the proper installation of the pipe supplied with said order. This lubricant shall be nontoxic, impart no taste or smell to the water, and have no harmful effect on the rubber gasket. It shall have a consistency that will allow it to be easily applied to the pipe in either hot or cold weather and that will enable it to adhere to either wet or dry pipe.
- 2.1.8 Standard and special fittings shall be ductile iron. Use standard mechanical joint fittings or anchoring tees at hydrant locations. All fittings shall conform to the specifications of ANSI A21.10/AWWA C110 or ANSI A21.53/AWWA C153.
- 2.1.9 Pipe and fittings shall be lined with a thin cement lining as specified in ANSI A21.4/AWWA C104. In addition, a petroleum asphaltic coat approximately 1 mil thick shall be applied to the cement lining in accordance with the pipe manufacturer's standard practices. The outside coating shall be a petroleum asphaltic coating approximately 1 mil thick.
- 2.1.10 All fittings shall be mechanical joint unless otherwise shown on the contract drawings or directed by the water department. Where flanged pipe is shown no substitution of a Uni-Flange type joint will be used without prior approval of the Water Department.



- 2.1.11 Fittings, 6-inch through 24-inch size shall be the compact body type and shall conform to the specifications of ANSI/AWWA C110/A21.53 (latest edition) in all respects.
- 2.1.12 Fittings shall be in accordance with the standard mechanical joint fittings manufactured by the U.S. Pipe and Foundry Company, American Cast Iron Pipe Company, Union Foundry, Griffin, or Tyler.
- 2.1.13 The pipe manufacturer is to furnish the Water Department a certificate of inspection, sworn to by the factory inspector in the presence of a notary public, stating that the pieces of pipe in the shipment were made and tested in accordance with ANSI A21.51 and that they were subjected to and withstood a hydrostatic pressure of 500 psi. Each statement is to give the number of pieces of pipe in the shipment, the length of each piece of pipe, and the serial number of each piece of pipe making up the shipment. In addition, the weight of each individual piece of pipe making up the shipment is to be listed opposite the serial number of each pipe length and attached to the certificate of inspection.

## PART 3 EXECUTION

### 3.1 INSTALLATION OF WATER LINES

***NO CONNECTION TO AN EXISTING WATER LINE SHALL BE MADE UNTIL ALL LINES HAVE BEEN TESTED AND APPROVED FOR SERVICE BY THE WATER DEPARTMENT'S FIELD REPRESENTATIVE***

- 3.1.1 Lay water lines to the line and grade required by the drawings. All fittings, valves, and hydrants shall be at the required locations, the spigots centered in the bells, and all valve and hydrant stems plumb.
- 3.1.2 Unless otherwise indicated by the drawings, all water lines shall have at least 36 inches of cover. No departure from this policy shall be made except with the approval of the Water Department.
- 3.1.3 Provide and use tools and facilities that are satisfactory to the Water Department and that will allow the work to be done in a safe and convenient manner. All pipe, fittings, valves, and hydrants are to be unloaded from the trucks using suitable tools and equipment. Use a derrick, ropes, or other suitable tools or equipment to lower all pipe, fittings, valves, and hydrants into the trench one piece at a time. Lower each piece carefully so that neither it nor any protective coating or lining it may have will be damaged. Under no circumstances drop or dump water line materials into the trench.

- 3.1.4 Any pipes strung out along the route of the proposed lines before the actual installation of those lines is due to take place shall not be lowered into the trench until they have been swabbed to remove any mud, debris, etc., that may have accumulated within them. Remove all unnecessary material from the bell and spigot end of each pipe. Before any pipe is laid, brush and wipe clean the outside of its spigot end and the inside of its bell, and leave dry and oil-free.
- 3.1.5 Take every precaution to keep foreign material from getting into the pipe while it is being placed in the line. If the crew laying the pipe cannot put it into the trench and in place without allowing earth to get inside, then put a heavy, tightly woven canvas bag of suitable size over each end of the pipe, and leave in place until it is time to connect that pipe to the one adjacent to it.
- 3.1.6 Place no debris, tools, clothing, or other materials in the pipe during laying operations.
- 3.1.7 After a length of pipe has been placed in the trench, center the spigot end in the bell of the adjacent pipe, and then insert to the depth specified by the manufacturer and bring to the correct line and grade. Secure the pipe in place by tamping an approved backfill material around it.
- 3.1.8 Bell holes shall be big enough so that there is ample room for the pipe joints to be properly made. Between bell holes, carefully grade the bottom of the trench so that each pipe barrel will rest on a solid foundation for its entire length.
- 3.1.9 Whenever pipe laying is not in progress, close the open ends of pipe either with a watertight plug or by other means approved by the water department. This shall be done not only at the end of each working day but also before work is stopped for lunch periods, bad weather, or any other reason. If there is water in a trench, leave this seal in place until the trench has been pumped completely dry.
- 3.1.10 Cut pipe so that valves, fittings, or closure pieces can be inserted in a neat and workmanlike manner and without any damage to the pipe. Follow the manufacturer's recommendations concerning how to cut and machine the ends of the pipe in order to leave a smooth end at right angles to the pipe's axis.
- 3.1.11 Lay pipe with the bell ends facing in the direction of laying unless otherwise directed by the water department.

- 3.1.12 Wherever pipe must be deflected from a straight line (in either the vertical or horizontal plane) in order to avoid obstructions or plumb stems, or wherever long radius curves are permitted, the amount of deflection shall not exceed that necessary for the joint to be satisfactorily made, nor that recommended by the pipe manufacturer, and shall be approved by the Water Department.
- 3.1.13 Lay no pipe in water or when it is the Water Department's opinion that trench conditions are unsuitable. If crushed stone is used to improve trench conditions or as backfill for bedding the pipe, its use is considered incidental to the project.
- 3.1.14 Where a water line crosses over a wastewater line, use a full joint of pipe and center over the wastewater providing 18 inch separation. Where a water line is to be parallel to wastewater, lay it at least 10 feet from the wastewater. If it is not practical for the water and wastewater lines to be separated as described above, then lay the water line at least 18 inches above the top of the wastewater.
- 3.1.15 Join all pipe in the exact manner specified by the manufacturer of the pipe and jointing materials.
- 3.1.16 Thrust blocking must be used at all fittings in accordance with standard drawings 221-A and 221-B in these specifications.

## **3.2 HYDROSTATIC TESTS**

### **3.2.1 Pressure/Leakage Test**

- 3.2.1.1 After pipe has been laid and backfilled as specified above, subject all newly laid pipe or any valved section thereof to a pressure of 200 psi or 1.5 times the working pressure, whichever is greater. All services are to be laid prior to testing the main and tested as part of the test of the main.
- 3.2.1.2 The duration of each pressure/leakage test shall be at least two hours. The specified pressure shall not vary more than 5 psi during this test.
- 3.2.1.3 Slowly fill each valved section of pipe with water. Generally the newly laid line is to be filled using a 1 inch line between an existing water line and the new line. A 1 inch corporation cock is to be installed on each line and a 1 inch meter and 1 inch check valve installed in this line. Insert plugs in these taps after all tests are completed. Flush the line until chlorine residual is below 5 PPM. Apply the specified test pressure (based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge) with a pump connected to the pipe in a manner satisfactory to the water department. Contractor shall furnish the pump, pipe, connections, gauges, meter, and all necessary apparatus as well as all necessary

assistance to conduct the test. Pipe shall be filled at least 24 hours prior to testing.

- 3.2.1.4 Before applying the specified test pressure, expel all air from the pipe. If hydrants or blowoffs are not available at high places, make the necessary taps at the points of highest elevation before testing, and insert plugs after the test has been completed.
- 3.2.1.5 Carefully examine all exposed pipes, fittings, valves, and hydrants during the test. Remove any cracked or defective pipes, fittings, valves, or hydrants discovered in consequence of this pressure test, and replace with sound material in the manner specified. Repeat the test until the results are satisfactory to the Water Department.
- 3.2.1.6 Leakage is defined as the amount of water which must be supplied to the newly laid pipe or any valved section in order to maintain the specified leakage test pressure within 5 psi of the specified test pressure after the pipe has been filled with water and the air expelled.
- 3.2.1.7 No pipe installation will be accepted until the leakage is less than the number of gallons per hour period listed below:

## HYDROSTATIC TESTING ALLOWANCE PER 1,000 FEET OF PIPELINE-GPH

| Average Test Pressure<br>psi | Nominal Pipe Diameter-in. |      |      |      |      |      |      |      |      |      |      |      |      |
|------------------------------|---------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
|                              | 6                         | 8    | 10   | 12   | 14   | 16   | 18   | 20   | 24   | 30   | 36   | 42   | 48   |
| 450                          | 0.95                      | 1.27 | 1.59 | 1.91 | 2.23 | 2.55 | 2.87 | 3.18 | 3.82 | 4.78 | 5.73 | 6.69 | 7.64 |
| 400                          | 0.90                      | 1.20 | 1.50 | 1.80 | 2.10 | 2.40 | 2.70 | 3.00 | 3.60 | 4.50 | 5.41 | 6.31 | 7.21 |
| 350                          | 0.84                      | 1.12 | 1.40 | 1.69 | 1.97 | 2.25 | 2.53 | 2.81 | 3.37 | 4.21 | 5.06 | 5.90 | 6.74 |
| 300                          | 0.78                      | 1.04 | 1.30 | 1.56 | 1.82 | 2.08 | 2.34 | 2.60 | 3.12 | 3.90 | 4.68 | 5.46 | 6.24 |
| 275                          | 0.75                      | 1.00 | 1.24 | 1.49 | 1.74 | 1.99 | 2.24 | 2.49 | 2.99 | 3.73 | 4.48 | 5.23 | 5.98 |
| 250                          | 0.71                      | 0.95 | 1.19 | 1.42 | 1.66 | 1.90 | 2.14 | 2.37 | 2.85 | 3.56 | 4.27 | 4.99 | 5.70 |
| 225                          | 0.68                      | 0.90 | 1.13 | 1.35 | 1.58 | 1.80 | 2.03 | 2.25 | 2.70 | 3.38 | 4.05 | 4.73 | 5.41 |
| 200                          | 0.64                      | 0.85 | 1.06 | 1.28 | 1.48 | 1.70 | 1.91 | 2.12 | 2.55 | 3.19 | 3.82 | 4.46 | 5.09 |
| 175                          | 0.59                      | 0.80 | 0.99 | 1.19 | 1.39 | 1.59 | 1.79 | 1.98 | 2.38 | 2.98 | 3.58 | 4.17 | 4.77 |
| 150                          | 0.55                      | 0.74 | 0.92 | 1.10 | 1.29 | 1.47 | 1.66 | 1.84 | 2.21 | 2.76 | 3.31 | 3.86 | 4.41 |
| 125                          | 0.50                      | 0.67 | 0.84 | 1.01 | 1.18 | 1.34 | 1.50 | 1.68 | 2.01 | 2.52 | 3.02 | 3.53 | 4.03 |
| 100                          | 0.45                      | 0.60 | 0.75 | 0.90 | 1.05 | 1.20 | 1.35 | 1.50 | 1.80 | 2.25 | 2.70 | 3.15 | 3.60 |

\*If the pipeline under test contains sections of various diameters, the testing allowance will be the sum of the testing allowance for each size.

+Calculated on the basis of Eq. 1

\*Reproduced from ANSI/AWWA C600-99 Publication

3.2.2.5 Should any test of pipe laid disclose leakage greater than that specified, the Contractor shall, at his own expense, locate and repair the defective joints until the leakage is within the specified allowance.

### 3.2.3 Pressure Recording

3.2.3.1 The Contractor is to provide a connection on his test apparatus for the Water Department to install a pressure recorder during the hydrostatic tests when so directed.

### 3.3 **DISINFECTION**

- 3.3.1 During construction, take precautions to protect pipe interiors, fittings, and valves against contamination. When pipe laying is not in progress (e.g., at the end of the day's work), place watertight plugs in the ends of all pipe already in the trench; if water accumulates in the trench, leave the plugs in place until the trench is dry. Complete the joints of all pipe in the trench before stopping work for any reason.
- 3.3.2 If dirt or other foreign material that has gotten into a pipe will not, in the opinion of the water department, be removed by flushing, clean the interior of the pipe, and swab with a disinfecting solution of 5 percent hypochlorite.
- 3.3.3 Make water flow from the existing distribution system or some other source approved by the Water Department into the newly laid pipeline, and add chlorine to it. Feed water into the pipe, and chlorine into the water, at constant, measured rates so proportioned that the chlorine concentration in the water in the pipe is kept at a minimum of 50 mg/l available chlorine. To ensure that this concentration is maintained, measure the chlorine residual at regular intervals.
- 3.3.4 Table I shows how much chlorine is needed for each 100 feet of line for pipes of various diameters. A 1 percent chlorine solution may be prepared either with 1 pound of calcium hypochlorite for each 8.5 gallons of water or with sodium hypochlorite.

TABLE I  
CHLORINE REQUIRED TO PRODUCE A 50 mg/L CONCENTRATION  
IN 100 FEET OF PIPE, BY DIAMETER

| <u>Pipe Size (Inches)</u> | <u>100% Chlorine (Pounds)</u> | <u>1% Chlorine Solutions (Gallons)</u> |
|---------------------------|-------------------------------|--|
| 6                         | 0.061                         | 0.73                                   |
| 8                         | 0.108                         | 1.30                                   |
| 10                        | 0.170                         | 2.04                                   |
| 12                        | 0.240                         | 2.88                                   |
| 14                        | 0.328                         | 3.96                                   |
| 16                        | 0.428                         | 5.20                                   |
| 18                        | 0.540                         | 6.58                                   |
| 20                        | 0.680                         | 8.12                                   |
| 24                        | 0.980                         | 11.70                                  |
| 30                        | 1.526                         | 18.28                                  |
| 36                        | 2.197                         | 26.32                                  |
| 42                        | 2.991                         | 35.83                                  |
| 48                        | 3.906                         | 46.80                                  |

- 3.3.5 While the chlorine is being applied, manipulate valves so that the treatment dosage will not flow back into the line that is supplying the water. Continue the application of chlorine until the entire line being treated is filled with the chlorine solution. Then retain the chlorinated water in the line for at least 24 hours, during which time all valves and hydrants in the line being treated shall be operated so that appurtenances can also be disinfected. After 24 hours, the treated water shall have a chlorine concentration of at least 25 mg/l throughout the line.
- 3.3.6 After the applicable retention period, flush the heavily chlorinated water from the line until the chlorine concentration in the water leaving the main is no higher than that generally prevailing in the system, or less than 1 mg/l. Perform such flushing only at sites where there is adequate drainage.
- 3.3.7 The velocity of the water used to flush a line shall be at least 2.5 fps. The flow rates required to produce this velocity in various sizes of pipe are shown in Table II.

TABLE II  
REQUIRED OPENINGS TO FLUSH PIPELINES  
(40 PSI RESIDUAL PRESSURE)

| <u>Pipe Size<br/>(Inches)</u> | <u>Flow Required<br/>To Produce<br/>2.5 fps Velocity<br/>(gpm)</u> | <u>Orifice<br/>Size<br/>(Inches)</u> | <u>Hydrant<br/>Outlet Nozzles*</u> |                          |
|-------------------------------|--|--------------------------------------|------------------------------------|--------------------------|
|                               |  |                                      | <u>Number</u>                      | <u>Size<br/>(Inches)</u> |
| 6                             | 220  | 1-3/8                                | 1                                  | 2-1/2                    |
| 8                             | 390  | 1-7/8                                | 1                                  | 2-1/2                    |
| 10                            | 610  | 2-5/16                               | 1                                  | 2-1/2                    |
| 12                            | 880  | 2-13/16                              | 1                                  | 2-1/2                    |
| 14                            | 1,200  | 3-1/4                                | 2                                  | 2-1/2                    |
| 16                            | 1,565  | 3-5/8                                | 2                                  | 2-1/2                    |
| 18                            | 1,980  | 4-3/16                               | 2                                  | 2-1/2                    |
| 20                            | 2,440  | -----                                | 1                                  | 4-1/2                    |
| 24                            | 3,470  | -----                                | 2                                  | 4-1/2                    |

\* With a 40 psi pressure in the main with the hydrant flowing to the atmosphere, a 2-1/2 inch hydrant outlet will discharge approximately 1,000 gpm and a 4-1/2 inch hydrant outlet will discharge approximately 2,500 gpm.

3.3.8 Once a line has been flushed, test to make certain that the residual chlorine in the water is within acceptable limits.

3.3.9 It must be noted that flushing is no substitute for taking preventative measures before and during the laying of water lines. Certain contaminants--especially those in caked deposits--are difficult or even impossible to remove by flushing, no matter how high the velocity. Furthermore, in pipes with diameters of 16 inches or more, it can be difficult to achieve even the minimum recommended flushing velocity of 2.5 fps.

### 3.4 BACTERIOLOGICAL TESTS

3.4.1 After a water line has undergone final flushing but before it is placed into service, collect a sample for bacteriological testing from the end of that line. In the case of extremely long lines, take additional samples if the Water Department so directs.

3.4.2 Collect these samples in sterile bottles treated with sodium thiosulphate. Do not use a hose or fire hydrant to collect samples. One suggested sampling method is to install a standard corporation cock in the line with a copper tube



gooseneck assembly; after the samples have been taken, the gooseneck assembly can be removed and retained for later use.

3.4.3 The samples will be collected by the Field Representative and delivered to a laboratory approved by TDEC for performing bacteriological analysis for public water systems to be tested for bacteriological quality in order to determine if they contain any coliform organisms. If the initial disinfection fails to produce satisfactory samples, repeat disinfection until satisfactory samples are obtained. After a second failure to obtain approved results, the Water Department may require water lines to be pressure washed or other suitable cleaning procedures to ensure sanitary conditions before retesting.

3.4.4 When the samples tested are found to be satisfactory, the water line may be placed in service provided all other requirements have been met. **NEVER PLACE A WATER MAIN IN SERVICE WITHOUT FIELD REPRESENTATIVE'S PRESENCE.**

### **3.5 DISINFECTION PROCEDURE AFTER CUTTING INTO OR REPAIRING EXISTING LINES**

3.5.1 The procedures outlined above apply primarily to cases in which the lines are wholly or partially dewatered.

3.5.2 However, leaks or breaks that are repaired with clamping devices while the lines remain full of water under pressure present little danger of contamination and require no disinfection.

3.5.3 When an existing line is opened, whether by accident or design, the excavated area could be wet and contaminated because of the presence of wastewater nearby. The danger of contamination from such pollution can be lessened if liberal quantities of hypochlorite are applied to the open trenches. It is better to use tablets for disinfection in such cases because they dissolve slowly and continue to release hypochlorite as water is pumped from the excavation site.

3.5.4 Where practical, treat the lines by the slug method in accordance with AWWA C651.

3.5.5 The following disinfection procedure is considered the minimum that may be used when existing lines are repaired:

3.5.5.1 Swab the interior of all pipes and fittings (particularly couplings and tapping sleeves) that are to be used in repairing an existing line with a solution of 5 percent hypochlorite before installing them.

- 3.5.5.2 The most practical means of removing contamination introduced into a line during repairs is to give the line a thorough flushing. If the locations of valves and hydrants make it possible, flushing in both directions is recommended. Start flushing as soon as repairs are completed, and continue until all discolored water is eliminated.

3.6 **CLEANUP**

- 3.6.1 After completing each section of water line, remove all debris and all construction materials from the work site. Then grade and smooth over the surface on both sides of the line. Leave the entire area clean and in a condition satisfactory to the City of Franklin.

END OF SECTION

## CHAPTER 4

### VALVES, HYDRANTS, AND BLOWOFFS

#### PART 1 GENERAL INFORMATION

- 1.1 Refer to other sections for work related to that specified under this heading.

#### PART 2 PRODUCTS

##### 2.1 **GATE VALVES**

- 2.1.1 Gate valves on wastewater force mains 4 inches through and including 24 inches and water lines 10 inches and smaller shall be resilient seated, manufactured to meet or exceed the requirements of AWWA C509 of latest revision and in accordance with the following specifications and shall be manufactured by American Darling, M&H, Clow, U.S. Pipe, or Mueller, 2360 or 2631 Series.
- 2.1.2 Valves shall have an unobstructed waterway equal to or greater than the full nominal diameter of the valve.
- 2.1.3 The valves shall be nonrising stem with the stem made of bronze described in AWWA C509. Provide 2 stem seals of the O-ring type.
- 2.1.4 The stem nut, also made of bronze shall be independent of the gate.
- 2.1.5 The sealing mechanism shall consist of a cast or ductile iron wedge gate fully encapsulated in synthetic rubber or urethane. The resilient sealing mechanism shall provide zero leakage at 200 psi working pressure when installed with flow in either direction.
- 2.1.6 The valve body, bonnet, and bonnet cover shall be ductile iron or cast iron, ASTM A126, Class B, fully coated with fusion bonded epoxy, both interior and exterior.
- 2.1.7 All valves shall be tested in strict accordance with AWWA C509.
- 2.1.8 Buried valves shall be mechanical joint and equipped with a 2 inch square operations nut and shall be complete with a valve box specified herein. Valves in structures shall be flanged and equipped with removable hand wheel operators. Valves shall open to the left. All buried valves with wrench nut over 10 feet deep shall have an extension stem projecting within 2 feet of the ground surface and the stem extension shall be centered in the valve box

and anchored to prevent horizontal movement and pinned to the valve nut below. The valve manufacturer shall provide all glands, gaskets, and all the accessories necessary to install the valve.

## **2.2 TAPPING SLEEVES FOR DUCTILE IRON PIPE**

- 2.2.1 Tapping sleeves shall be a full sleeve, mechanical joint type manufactured from ductile iron meeting ASTM A536, Grade 65-45-12.
- 2.2.2 Sleeves shall be rated for a minimum of 250 psi water working pressure.
- 2.2.3 Side flange seals shall be of the O-ring type of either round or rectangular cross-sectional shape and shall butt against the split end gaskets to produce a totally watertight seal.
- 2.2.4 The flanged throat section of mechanical joint sleeves 12 inches and smaller shall be counter bored in accordance with MSS-SP60 for true alignment of the tapping valve and tapping machine. For sleeves with throat sections larger than 12 inches, the sleeves and tapping valves shall be provided by the same manufacturer.
- 2.2.5 The sleeve manufacturer shall furnish all the accessories necessary to assemble the sleeve to the pipe.
- 2.2.6 The inside and outside of all tapping sleeves shall be coated in accordance with AWWA standards and Federal Specifications TT-V-51.
- 2.2.7 Sleeves shall be provided with a test plug on the outlet throat.
- 2.2.8 The tapping sleeve shall be a Mueller H-615, or approved equal.

## **2.3 TESTING TAPPING SLEEVES**

- 2.3.1 Tapping sleeves shall be subjected to a pressure test while in place on the existing water line, prior to the existing line being tapped. The tapping sleeve and valve shall be subjected to a pressure of 200 psi for a period of 15 minutes. The connection being tested shall maintain 100 percent of the test pressure throughout the test period. The Contractor shall supply all necessary equipment for testing sleeves. Other details of the test shall be as directed by the water department.

## **2.4 TAPPING VALVES - RESILIENT SEATED GATE VALVE**

- 2.4.1 Tapping valves shall conform to AWWA C509 or latest revision covering gate valves except as modified for passage and clearance of tapping machine cutters. Valves shall be as manufactured by American Darling, M&H, Clow, U.S. Pipe, or Mueller.
- 2.4.2 Tapping valves shall meet all the requirements in Paragraph 2.1 above as well as having mechanical joints on one end and a tapping flange on the other end. The valve waterway shall be a full opening to admit a full size shell cutter.
- 2.4.3 Valves shall be furnished with tapping sleeve sized to ANSI B16.1 standards for flanges with male pilots for centering and the outlet side mechanical joint, conforming to AWWA C111. Flange and mechanical joint assemblies shall be supplied by the valve manufacturer.
- 2.4.4 The tapping valve shall be Mueller A2360 Series, or approved equal.

## 2.5 **BUTTERFLY VALVES**

- 2.5.1 Valves on water lines 12 inches and larger shall be butterfly valves, designed for direct burial service, and meet or exceed performance requirements for water application of applicable standards such as AWWA C504. Valves shall be fitted with operators designed to accept standard valve boxes and shall open to the left.
- 2.5.2 Bodies shall be constructed of cast iron (ASTM A126, Class B) and shall have integrally cast mechanical joint ends in accordance with AWWA C111. Accessories (bolts, glands, and gaskets) shall be supplied by the valve manufacturer. Valves shall include a stainless steel seat ring or a molded-in vulcanized Buna-N bonded to the valve body.
- 2.5.3 Vane for the valve employing stainless steel body seat shall be of cast iron ASTM A48, Class 40, and have the rubber seat mechanically secured with an integral 18-8 stainless steel clamp ring and 18-8 stainless steel nylon locked seat not penetrated by the valve shaft. Vane for valves employing molded-in vulcanized, bonded Buna-N body seat shall be constructed of ASTM A436 Ni-Resist, Type I.
- 2.5.4 Valve operators shall be of the traveling nut type designed to withstand a minimum input torque at fully open or fully closed position of 300 foot-pounds without damage to the valve or operator. It shall be designed to withstand continuous submergence in water to a head pressure of 25 feet. Valve operators shall be provided with 2 inch square operating nut and shall open left. All buried valves with wrench nut over 10 feet deep shall have an extension stem projecting within 2-feet of the ground surface. The valve

manufacturer shall provide the glands, gaskets, and all accessories necessary to install the valve.

- 2.5.5 Valves shall be Henry Pratt Company "Groundhog", Mueller Lineseal III, or DeZurick LA-Series.

## 2.6 **VALVE BOXES**

- 2.6.1 All valve box castings shall be pre-cast concrete made accurately to the required dimensions, and shall be sound, smooth, clean and free from blisters and other defects. Defective castings which have been plugged or otherwise treated to remedy defects shall be rejected. Contact surfaces of frames and covers shall be machined so that the covers rest securely in the frames with no rocking and with the cover in contact with the frames for the entire perimeter of the contact surface.

- 2.6.2 Install valve boxes on each proposed valve in accordance with the details shown on the standard drawings.

- 2.6.3 All valve boxes shall be John Bouchard No. 8006 or Vulcan No. V-8455, rectangular frame.

## 2.7 **FIRE HYDRANTS**

- 2.7.1 Fire hydrants shall comply in all respects with AWWA C502-64 latest and shall be of the compression type, with the main valve opening against the pressure and closing with the pressure. The main valve opening shall be 5-1/4-inch in diameter. Hydrants shall be connected to the main by a 6-inch mechanical joint shoe, unless otherwise shown on the drawings, and fitted with strapping lugs. Two 2-1/2-inch hose nipples and one 4-1/2-inch steamer nipple shall be threaded and screwed into the nozzle section and then pinned to prevent turning.

- 2.7.2 Hydrants shall be furnished with 1-inch square operating nuts. Operating nut shall be provided with convenient means to afford lubrication to ensure ease of operation and the prevention of wear and corrosion.

- 2.7.3 Hydrant shall be the dry barrel type, and ductile iron hydrant shoe shall have 2 positive acting noncorrodible drain valves that drain the hydrant completely by opening as soon as the main valve is closed and by closing tightly when the main valve is open. Drain valves operated by springs or gravity will not be acceptable.

- 2.7.4 The packing gland located in the bonnet shall be solid bronze, and gland bolts shall be steel with bronze nuts. A double O-ring seal may be used in lieu of conventional stuffing box.

- 2.7.5 The hydrant shall open by being turned to the left and be so marked on the bonnet in cast letters and arrow.
- 2.7.6 Threads on hose and steamer nipples, operating nut, and cap nuts shall conform to the water department standards.
- 2.7.7 Bury shall be a nominal 36 inches, with the depth being measured from grade line to bottom of trench or connecting pipe.
- 2.7.8 Hydrants shall be FM and UL listed and rated for 200 psi working pressure.
- 2.7.9 Hydrants shall be Mueller "Super Centurion 250", A423 American Darling, or M&H, C502, Style 129.
- 2.7.10 The hydrant shall have a bituminous coating for the buried portion of the hydrant and a red enamel finish for above ground portion of hydrant.

## 2.8 **BLOW-OFF HYDRANT**

- 2.8.1 See Detail, Section 5, Drawing No. W-2.

## 2.9 **AUTOMATIC AIR RELIEF VALVE**

- 2.9.1 The automatic air relief valve shall be suitable for pressure up to 300 psi. Inlet size shall be 1-inch unless shown otherwise on the plans. The body and cover shall be cast iron, float shall be stainless steel, seat and needle shall be brass, and the linkage shall be Delvin. Valves to be APCO No. 200A or approved equal.

# PART 3 EXECUTION

## 3.1 **SETTING VALVES AND FITTINGS**

### 3.1.1 General

- 3.1.1.1 Set valves, fittings, plugs, and caps and joint to pipe in the manner heretofore specified for cleaning, laying, and jointing pipe.

### 3.1.2 Location of Valves

- 3.1.2.1 Valves in water mains shall, where possible, be located on the street right-of-way (R.O.W.) lines extended.

### 3.1.3 Valve Boxes and Valve Pits

- 3.1.3.1 Provide a valve box for every valve with the lettering on the valve box cover being placed 90 degrees to the line.
- 3.1.3.2 The valve box shall not transmit shock or stress to the valve and shall be centered and plumb over the wrench nut of the valve, with the box cover flush with the surface of the finished pavement or such other level as may be directed by the water department.
- 3.1.3.3 If the top of the valve nut is over 24 inches below the top of the valve box, an extension stem shall be provided with nut within 12 inches of the top of the box.

## 3.2 **SETTING HYDRANTS**

- 3.2.1 Locate hydrants as shown on the drawings or as directed by the Water Department and in a manner that will provide complete accessibility and also minimize the possibility of damage from vehicles or injury to pedestrians. Hydrants shall be set between 3 feet to 7 feet behind the curb line when streets have curbs, unless sidewalks are installed in which case the hydrant and shut off valve shall be installed approximately 12 inches beyond the sidewalk.
- 3.2.2 All hydrants shall stand plumb and shall be set near normal bury. Set hydrants to the established grade, with the steamer nozzle between 18 inches and 24 inches above finish grade, as shown on the drawings or as directed by the Water Department.
- 3.2.3 Connection and Anchorage to Main
  - 3.2.3.1 A ductile iron anchoring tee with a 6 inch branch followed by a 6 inch gate valve shall be used to connect each hydrant to the main in accordance with standard drawing in these specifications. An anchoring pipe or section of pipe with a Meg-A-Lug or Ford Series 1400 Uni-Flange on each end shall be used to connect between the fire hydrant and the 6-inch gate valve. A concrete thrust block shall be installed when Meg-A-Lugs or Uni-Flange are used. Anchoring pipe shall be manufactured by Tyler, Clow, or U.S. Pipe.
- 3.2.4 Hydrant Drainage
  - 3.2.4.1 Provide drainage at the base of the hydrant by placing coarse gravel from the bottom of the trench to at least 6 inches above the waste opening in the hydrant to a distance of 1 foot around the elbow. Connect no drainage system to wastewater.

END OF SECTION



## CHAPTER 4

### WATER SERVICE ASSEMBLIES

#### PART 1 GENERAL INFORMATION

- 1.1 Refer to other sections for work related to that specified under this heading.

#### PART 2 PRODUCTS

##### 2.1 **SERVICE ASSEMBLY**

- 2.1.1 The service assembly shall include a corporation cock, copper service pipe, meter yoke, meter box, curb stop and tapping saddle as required.

##### 2.2 **CORPORATION COCK**

- 2.2.1 The corporation cock shall be of solid bronze suitable for a compression flange on the service pipe and for tapping into the water main. This cock shall be Mueller B-25008 ball valve. The threads on the corporation cock shall be AWWA.

##### 2.3 **CURB STOP**

- 2.3.1 The service lines shall terminate at the curb stop which is to be installed in a standard meter box. Curb stop to be Mueller B-25209 ball curb valve.

##### 2.4 **SERVICE PIPE**

- 2.4.1 Service pipe shall be a minimum 3/4 inch Type K copper meeting ASTM B88, latest, or of a size as approved by the water department.

##### 2.5 **METER BOXES**

- 2.5.1 Meter boxes for 5/8 inch x 3/4 inch assemblies shall be precast concrete, Brooks Products No. 36, 16 inch deep cover or Southern Meter Box, 23 inch x 16 inch x 12 inches deep. The lids shall be concrete with cast iron readerlid. The box shall be installed with one course of brick as a base. The cover shall be marked "WATER METER".

## **2.6 METER YOKES**

- 2.6.1 Meter yokes shall be Mueller H-14180F-2A with double purpose ends. Yokes to be fitted with angle ball valves (360 degree rotation) with provision for locking, ASSE dual check valves, saddle type swivel nuts, hard copper cross tubes, Mueller 110 compression inlet fittings, and double purpose (flare of FIP) outlet fittings. Copper cross tubes are to be of sufficient weight and hardness that they will not be bent during service installation or meter replacement.

## **2.7 RADIO READ**

- 2.7.1 All meters shall be equipped with Radio Read Technology by Invensus Technologies or approved equal.

## **PART 3 EXECUTION**

- 3.1 The service line shall have a minimum of 24-inch cover except under roads and sidewalks where it shall have minimum of 28-inch cover and set perpendicular to the property it is serving. After the line is installed and yoke set, turn water on service pipe between yoke and main, blowing any accumulated trash out of the pipe. A single piece of copper pipe shall be used from the main to the meter unless the meter is over 100 feet from the main.
- 3.2 In general, install the curb stops at the property line with a meter box, yoke and cast iron frame and cover. All residential meters shall be installed by the Water Department. No meter shall be removed, tampered with, relocated, etc. except by a authorized representative of the Water Department. No meter shall be removed, tampered with, relocated, etc., except by a authorized representative of the Water Department. Set plumb approximately 1 inch above the existing or proposed grade and so that surface drainage will not enter it. Fill from the existing or proposed grade to the top of the meter box at a slope of 1-inch in 12 inches. When the cut or fill slopes on streets extend beyond the street right-of-way, install the meter box at the top or toe of slope, as applicable, or as directed by the Water Department. Place a minimum of 2 cubic feet of clean 3/4 inch crushed stone under each meter box.
- 3.3 Set the yoke plumb and level.
- 3.4 For connecting the service lines to meter yokes and corporation cocks, use Mueller 110, curb stops with suitable adapters, compression type connections. Unions shall be Mueller H-15403 compression connection.
- 3.5 The meter box is to be installed at a location such that it will not be in a driveway or under shrubs and trees. If during construction of homes, the

meter location conflicts with the location of the driveway, then the meter shall be moved at the expense of the builder or developer. A 2-inch galvanize pipe shall be installed at the meter box with a minimum of 3 feet in the ground and 2 feet above ground. The above ground portion of the pipe shall be painted blue.

- 3.6 Refer to Drawing 215 in these specifications for proper installation of a 3/4-inch service assembly. For larger meters, see Drawings 240, 251, 252-A and 252-B in these specifications.

END OF SECTION

## CHAPTER 4

### WASTEWATER PIPE - GRAVITY

#### PART 1 GENERAL

- 1.1 Furnish all material, equipment, tools, and labor in connection with the sewage lines, complete and in accordance with the drawings and these specifications.
- 1.2 It shall be the Contractor's responsibility to ensure that all necessary materials are furnished to him and that those found to be defective in manufacture are replaced at no extra cost to the Owner. Materials damaged in handling after being delivered by the manufacturer shall be replaced at the Contractor's own expense. If installed material is found to be defective, the cost of both the material and labor needed to replace it shall not be passed on to the Wastewater Department.
- 1.3 The Contractor shall be responsible for safely storing materials needed for the work that have been accepted by him until they have been incorporated into the completed project. Keep the interiors of all pipes, fittings, and other accessories free from dirt and foreign matter at all times.
- 1.4 Refer to other sections for work related to that specified by this section. Coordinate this work with that required by other sections for timely execution.
- 1.5 Pipe material for wastewater lines 15 inches and smaller shall be PVC manufactured in accordance with ASTM D3034 and material for wastewater lines 18 inches through 27 inches shall be PVC manufactured in accordance with ASTM F679 unless otherwise shown on the Drawings. Ductile iron pipe shall be used only when so indicated on the Drawings.
- 1.6 Pipe material for wastewater lines 30 inches and larger shall be determined on an individual basis as approved by the Wastewater Department.
- 1.7 For PVC and ductile iron pipe, furnish a certificate from the pipe manufacturer indicating that the pipe meets all applicable requirements of these specifications.

#### PART 2 PRODUCTS

##### 2.1 **PIPE**

##### 2.1.1 **POLYVINYL CHLORIDE (PVC)**

2.1.1.1 Polyvinyl Chloride (PVC) shall conform to the requirements of ASTM D3034, SDR 35 for sizes 4 inches through 15 inches and ASTM F679 (wall thickness T-1) for sizes 18 inches through 27 inches suitable for use as a gravity wastewater conduit with provisions for contraction and expansion at each joint; with a rubber ring and standard lengths of 12.5 feet plus or minus 1 inch; designed to pass all tests at 73 degrees F (plus or minus 3 degrees F); 6 inch long sections of pipe to be subjected to impact from a free falling type (20 pounds, TUP A) in accordance with ASTM D2444 with no evident splitting or shattering (denting not considered a failure); and with a minimum envelope of 6 inches of granular material around the pipe, but with all other bedding and backfilling requirements remaining the same as for other pipe material. PVC pipe shall be manufactured by NAPCO, Vulcan, Hawk, or Bristol Pipe.

## 2.1.2 DUCTILE IRON

2.1.2.1 Ductile iron pipe shall conform to the requirements of ANSI 21.51/AWWA C151 for ductile iron pipe centrifugally cast in metal or sand-lined molds. It shall be made and tested in accordance with ASTM A536 and be subjected to and able to withstand a hydrostatic pressure of 500 psi.

2.1.2.2 The outside coating for ductile iron wastewater pipe shall be an asphaltic coating approximately 1 mil thick as specified in AWWA C151. The inside of the pipes shall be Protecto 401 Ceramic Epoxy Coating 40 mils DFT or equal. Push-on joints shall be either "Fastite" (by American Cast Iron Pipe Company), "Tyton" (by U.S. Pipe and Foundry Company), "Super Bell-Tite" (by McWane or Griffin), conforming to ASTM A746 and having a wall thickness of Class 51 (Special Class) unless determined otherwise by the Wastewater Department.

2.1.3 Lateral Branches: To be of the same material and manufacturer as the main wastewater and have 4 inch inside diameter unless otherwise specified or noted; able to withstand all test pressures involved without leakage.

## 2.2 JOINTS AND JOINTING MATERIALS

2.2.1 Polyvinyl Chloride (PVC) Pipe Joints: Bell and spigot type with a rubber ring suitable to meet all test requirements of these specifications.

2.2.2 Ductile Iron Pipe Joints: Gasket type joints for bell and spigot ductile iron pipe designed to meet the infiltration requirements of these specifications; jointing to comply with the applicable provisions of ANSI A21.11.

2.2.3 PVC Wastewater Fittings: Fittings shall conform to the requirements of ASTM D 3034 specification, latest edition. Gaskets for elastomeric joints shall be molded with a minimum cross sectional area of 0.20 sq. in. and conform to ASTM F 477 specification. Fittings shall be tee-wye as manufactured by

Harco or Plastic Trends. Service line caps are to be Fernco "Quick" cap or Indiana Seal.

## **2.3 VALVE BOXES**

- 2.3.1 Boxes shall be of concrete with a solid one piece cast iron cover as manufactured by Southern Meter Box or of polymer concrete and fiber reinforced polyester as manufactured by CDR. The boxes shall be heavy duty suitable for traffic and of the approximate size and depth as shown on the standard drawing. A minimum 2-1/2 inch diameter 16 gage steel reflector shall be applied to the underside of the fiber cover for electronic detection.

## **PART 3 EXECUTION**

### **3.1 PIPE LAYING**

- 3.1.1 Lay no pipe except in the presence of the Wastewater Department.
- 3.1.2 Before placing wastewater pipe in position in the trench, carefully prepare the bottom and sides of the trench, and install any necessary bracing and sheeting as provided in Section 02222, Unclassified Excavation for Utilities.
- 3.1.3 Wherever necessary to provide satisfactory bearing surface, place concrete cradles as shown on the drawings or as directed by the Wastewater Department. Cradles shall be of concrete and conform to the dimensions shown on the drawings. Concrete placed outside the dimensions shown shall be at the Contractor's expense.
- 3.1.4 Lasers must be used after the type and procedures are approved by the Wastewater Department. When lasers are used, set reference points for both line and grade at each manhole. Where grades are 0.6% or less, check the elevation of the beam each 100 feet with an offset point or engineer's level.
- 3.1.5 Do not allow water to run or stand in the trench while pipe laying is in progress or before the trench has been backfilled. Do not at any time open up more trench than the available pumping facilities are able to dewater.
- 3.1.6 Correct trench bottoms found to be unsuitable for foundations after pipe laying operations have started, bringing them to exact line and grade with compacted stone as necessary.
- 3.1.7 Carefully inspect each piece of pipe and special fitting before it is placed, and lay no defective pipe in the trench. Pipe laying shall proceed upgrade, starting at the lower end of the grade and with the bells upgrade. When pipe laying is not in progress, keep the ends of the pipe tightly closed with an approved temporary plug.

- 3.1.8 Bell holes shall be large enough to allow ample room for the pipe joints to be properly made. Cut out bell holes no more than 2 joints ahead of the pipe laying. Carefully grade the bottom of the trench between bell holes so that each pipe barrel rests on a solid foundation for its entire length. Lay each pipe joint so as to form a close concentric joint with adjoining pipe and to avoid any offsets or inequalities in the flow line.
- 3.1.9 Before constructing or placing any joints, demonstrate to the Wastewater Department, by completing at least one sample joint, that the methods to be used conform to the specifications and will provide a watertight joint and further that the workmen to be involved in this phase of work are thoroughly familiar and experienced with the type of joint proposed.
- 3.1.10 No other type of joint may be used unless authorized in writing by the Wastewater Department.
- 3.1.11 Install tee branches in wastewater lines to serve promptly each lot facing or abutting on the street or alley in which wastewater is being laid and at such other locations as may be designated by the Wastewater Department. In addition, for lines in easements, lay a minimum 10 foot section of service line, and for rights-of-way, lay the service line 2 feet inside the property line. If tee branches are not to be used immediately, close them with a cap that is held in place to prevent infiltration and withstand all test requirements.
- 3.1.12 New service laterals shall conform to the standard drawings.
- 3.1.13 As the work progresses, thoroughly clean the interior of the pipe in place. After each line of pipe has been laid, carefully inspect it, and remove all earth, trash, rags, and other foreign matter from its interior.
- 3.1.14 After the joints have been completed, they shall be inspected before being covered. The pipe shall meet the test requirements for water tightness; immediately repair any leak or defect discovered at any time after completion of the work. Any pipe that has been disturbed after joints were formed shall be taken up, the joints cleaned and remade, and the pipe relaid at the Contractor's expense. Carefully protect all pipe in place from damage until backfilling operations are completed.
- 3.1.15 Do not begin the backfilling of trenches until the pipe in place has been inspected by the Wastewater Department.
- 3.1.16 Lay wastewater at least 10 feet horizontally from any existing or proposed water main. If this is not practical, the wastewater may be laid closer than 10 feet to a water main provided it is laid in a separate trench and the elevation of

the top of the wastewater is at least 18 inches below the bottom of the water main.

- 3.1.17 Where a wastewater line crosses under water mains, the top of the wastewater shall be at least 18 inches below the bottom of the water main. If the elevation of the wastewater cannot be varied to meet the above requirements, relocate the water main to provide this separation, or else reconstruct it with mechanical joint ductile iron pipe for a distance of 10 feet on each side of the wastewater with a full joint of the water main centered over the wastewater, and encased in concrete.
- 3.1.18 If it is impossible to obtain proper horizontal and vertical separation as stipulated above, construct both the water main and the wastewater of mechanical joint ductile iron pipe, and pressure test each.
- 3.1.19 Perform boring by means of augering to the size, line, and grade shown on the drawings. Jack the steel casing pipe into place as the boring proceeds. Weld sections of casing pipe together to provide a watertight joint.
- 3.1.20 Make connections to all existing wastewater lines as shown on the drawings or as directed by the Wastewater Department. Make connections either by removing a section of the wastewater from the existing line and inserting a branch of the proper size or by constructing a manhole, junction box, regulator chamber, or other structure as shown on the Drawings. No pipe shall be connected to the existing system until all new up stream construction has been completed and approval by the Wastewater Department. No wastewater pipe shall be approved for use until all downstream facilities are installed, tested, and approved for service.
- 3.1.21 Join dissimilar pipe by using suitable compression couplings. If compression couplings are not available, make jointing with a special fabricated coupling approved by the Wastewater Department.
- 3.1.22 Provide concrete cap or ductile iron pipe as shown on the drawings for pipe wastewater that, when completed, have less than 2.5 feet of cover in nontraffic areas and 4 feet of cover in traffic areas. If such protection is not shown on the drawings, place it in accordance with the typical section shown.
- 3.1.23 Carefully protect from damage all existing wastewater, water lines, gas lines, sidewalks, curbs, gutters, pavements, electrical lines, and other utilities or structures in the vicinity of the work at all times. If it is necessary to repair, remove, and/or replace any such utility or structure in order to complete the work properly, do so in compliance with the provisions set forth in other section of these specifications. Any such work shall be considered incidental to the construction of pipe wastewater.



3.1.24 Water service connections that are damaged will be repaired or replaced by the Contractor.

3.1.25 Service or house connections to existing wastewater that are damaged or removed shall be repaired or replaced by the Contractor. Connections from Public to Private service lines shall be made using plastic or stiff coupling.

## 3.2 **TESTING OF GRAVITY WASTEWATER PIPE**

### 3.2.1 Visual Tests

3.2.1.1 Upon completion of the construction or earlier if the Wastewater Department deems advisable, the Wastewater Department will make a visual inspection of the wastewater and construction site. Immediately repair all leaks and defects found by such inspection.

3.2.1.2 In addition to general cleanup and leakage, the following standards shall be used to determine failure or defects of this project.

3.2.1.3 Wastewater shall be built so as to remain true to line and grade. The inclining grade of the bottom of the wastewater after completion shall be such that, after flooding, the flood water drains off so that no remaining puddle of water is deeper than 1/2 inch on pipe 36 inches internal diameter or smaller and 3/4 inch on pipe larger than 36 inches internal diameter. Any section of pipe that does not comply with the specifications at any time previous to one year after final acceptance of the work shall be replaced or relaid at the Contractor's expense.

3.2.1.4 The Contractor will be held strictly responsible that all parts of the work bear the load of the backfill. If defects develop in the pipe within one year from the date of final acceptance of the work, the Contractor will be required to replace, at his expense, all such defective pipe. To this end, the Contractor is advised to purchase pipe under a guarantee from the manufacturer, guaranteeing proper service of wastewater pipe under conditions established by the drawings, specifications, and local conditioning at the site of the work.

### 3.2.2 Air Testing for Wastewater

3.2.2.1 Perform low pressure air testing as follows:

3.2.2.1.1 Furnish all equipment, facilities, and personnel necessary to conduct the test. The test shall be observed by a representative of the Owner.

3.2.2.1.2 Make the air test after all services have been installed and at least 7 days after backfilling has been completed and compacted.

- 3.2.2.1.3 Perform the first series of air tests after 1,000 LF but before 2,000 LF of wastewater has been laid. The purpose of this first series of tests is to assure both the Contractor and the Owner that the materials and method of installation meet the intent of these specifications. If the total length of wastewater for the project is less than 5,000 feet, this requirement may be waived by the Field Representative. Conduct the remainder of the tests after approximately each 10,000 LF has been laid.
- 3.2.2.1.4 Plug all tees and ends of wastewater services with flexible joint caps securely fastened to withstand the internal test pressures. Such caps shall be readily removable, and their removal shall provide a socket suitable for making a lateral connection or extension.
- 3.2.2.1.5 Prior to testing, check the pipe to see that it is clean. If not, clean it by passing a full-gauge squeegee through the pipe. It shall be the Contractor's responsibility to have the pipe cleaned.
- 3.2.2.1.6 Immediately following this check or cleaning, test the pipe installation with low pressure air. Supply the air slowly to the plugged pipe installation until the internal air pressure reaches 4.0 psi more than the average back pressure of any ground water that may submerge the pipe. Allow at least 2 minutes for temperature stabilization.
- 3.2.2.1.7 The pipeline shall be considered acceptable when tested at an average pressure of 3.0 psi more than the average back pressure of any ground water that may submerge the pipe, if the section under test does not lose air at a rate greater than 0.0015 cfm per square foot of internal pipe surface area. The requirements of this specification shall be considered satisfied if the time required in seconds for the pressure to decrease from 3.5 to 2.5 psi more than the average back pressure of any ground water that may submerge the pipe is not less than that shown in the following table:

**TABLE 1**

**MINIMUM SPECIFIED TIME REQUIRED FOR A 1.0 PSIG PRESSURE DROP  
FOR SIZE AND LENGTH OF PIPE INDICATED FOR Q=0.0015**

| Pipe Diameter (in.) | Min. Time (min: sec) | Length for Min. (ft) | Time for Longer Length (sec) | Specification Time for Length (L) |        |        |        |        |        |        |        |
|---------------------|----------------------|----------------------|------------------------------|-----------------------------------|--------|--------|--------|--------|--------|--------|--------|
|                     |                      |                      |                              | 100 ft                            | 150 ft | 200 ft | 250 ft | 300 ft | 350 ft | 400 ft | 450 ft |
| 4                   | 3:46                 | 597                  | .380 L                       | 3:46                              | 3:46   | 3:46   | 3:46   | 3:46   | 3:46   | 3:46   | 3:46   |
| 6                   | 5:40                 | 398                  | .854 L                       | 5:40                              | 5:40   | 5:50   | 5:40   | 5:40   | 5:40   | 5:42   | 6:24   |
| 8                   | 7:34                 | 298                  | 1.520 L                      | 7:34                              | 7:34   | 7:34   | 7:34   | 7:36   | 8:52   | 10:08  | 11:24  |
| 10                  | 9:26                 | 239                  | 2.374 L                      | 9:26                              | 9:26   | 9:26   | 9:53   | 11:52  | 13:51  | 15:49  | 17:48  |
| 12                  | 11:20                | 199                  | 3.418 L                      | 11:20                             | 11:20  | 11:24  | 14:15  | 17:05  | 19:56  | 22:47  | 25:38  |
| 15                  | 14:10                | 159                  | 5.342 L                      | 14:10                             | 14:10  | 17:48  | 22:15  | 26:42  | 31:09  | 35:36  | 40:04  |
| 18                  | 17:00                | 133                  | 7.692 L                      | 17:00                             | 19:13  | 25:38  | 32:03  | 38:27  | 44:52  | 51:16  | 57:41  |
| 21                  | 19:50                | 114                  | 10.470 L                     | 19:50                             | 26:10  | 34:54  | 43:37  | 52:21  | 61:00  | 69:48  | 78:31  |
| 24                  | 22:40                | 99                   | 13.674 L                     | 22:47                             | 34:11  | 45:34  | 56:58  | 68:22  | 79:46  | 91:10  | 102:33 |

Replicated from UNI-B-6-98 Publication

3.2.2.1.8 If the pipe installation fails to meet these requirements, the Contractor shall determine at his own expense the source or sources of leakage and repair or replace all defective materials or workmanship. The completed pipe installation shall meet the requirements of this test before being considered acceptable.

3.2.2.2 The recommended procedures for conducting acceptance tests are as follows:

3.2.2.2.1 Clean pipe that is to be tested.

3.2.2.2.2 Plug all pipe outlets with suitable test plugs, and brace each plug securely.

3.2.2.2.3 Increase gauge pressure in the test by the amount of ground water pressure at the crown of the pipe.

3.2.2.2.4 Add air slowly to the portion of the pipe installation being tested until the internal air pressure is raised to 4.0 psi more than the average back pressure above the crown of the pipe.

3.2.2.2.5 After the above internal pressure is obtained, allow at least 2 minutes for air temperature to stabilize, adding only the amount of air required to maintain pressure.

3.2.2.2.6 After 2 minutes, disconnect the air supply.

3.2.2.2.7 When pressure decreases to 3.5 psig either by leaking down or by bleeding down with a release valve, start the stopwatch, and determine the time in seconds that is required for the internal air pressure to reach 2.5 psig. Compare this time interval as calculated above. If the time is more than that calculated, the test shall be assumed to be acceptable.

3.2.2.3 Plugs used to close the wastewater pipe for the air test must be securely braced to prevent the unintentional release of the plug, which can become a high velocity projectile. Locate gauges, air piping manifolds, and valves at the top of the ground. No one shall be permitted to enter a manhole where a plugged pipe is under pressure. Four pounds air pressure (gauge) develops a force against the plug in a 12 inch pipe of approximately 450 pounds. Provide a safety release device set to release at 10 psi between the air supply and the wastewater under test.

3.2.2.4 Regardless of the outcome of the tests, repair any noticeable leak.

### **3.3 VISUAL INSPECTION OF MISCELLANEOUS MATERIALS**

3.3.1 All material used on this project will be visually inspected by the Wastewater Department at the site for conformance to the required specifications. When reasonable doubt exists that said material meets the specifications, the Wastewater Department may require certified mill tests, samples, and/or tests by an independent laboratory or other suitable form of verification that the material meets the required specifications.

### **3.4 DEFLECTION TESTING FOR PVC PIPE**

3.4.1 Deflection of the pipe by passing 9-arm pin go/no-go mandrel sized to 95% of the inside pipe diameter of the actual pipe in place and covered. The Contractor will furnish the mandrel which shall be approved by the Wastewater Department. Make this acceptance test after backfill consolidation has occurred and upon the A/E's approval. A minimum of 30 days shall elapse from the final backfilling prior to this test or after two (2) substantial rainfall events after backfilling operations are completed.

### **3.5 INTERNAL TV INSPECTION**

- 3.5.1 The Wastewater Department may conduct an internal inspection of the wastewater with a Television instrument at no cost to the Contractor. The Contractor will be responsible for correcting all deficiencies discovered by this TV inspection. This internal inspection will be conducted following the inspection of the project by the Field Representative.

### **3.6 ALTERNATIVE METHODS**

- 3.6.1 New wastewater systems may be designed by alternative methods other than on the basis of per capita flow rates as approved by the City of Franklin. Alternative methods may include the use of peaking factors of the contributing area, allowances for future commercial and industrial areas, separation of infiltration and inflow from the normal sanitary flow, and modification of per capita flow rates (based on specific data). Documentation of the alternative method used shall be provided. When infiltration is calculated separately from the normal sanitary flow, the maximum allowable infiltration rate shall be 25 gallons per day per inch diameter of the line per mile of wastewater.

### **3.7 CLEANUP**

- 3.7.1 After completing each section of the wastewater line, remove all debris, construction materials, and equipment from the site of the work, grade and smooth over the surface on both sides of the line, and leave the entire right-of-way in a clean, neat, and serviceable condition.

END OF SECTION

## CHAPTER 4

### MANHOLES

#### PART 1 GENERAL INFORMATION

- 1.1 Manholes shall be precast or poured in place concrete with eccentric cones. When a force main enters the new wastewater lines, the connecting manhole shall be made of fiberglass.
- 1.2 Refer to other sections for items affecting manholes. Coordinate this work with that specified by other sections for timely execution.

#### PART 2 PRODUCTS

- 2.1 **CONCRETE MASONRY:** Reinforced or plain, meeting the applicable requirements of Section 03303, Concrete for Utility Lines.
- 2.2 **CASTING ADJUSTMENT:** Precast concrete adjusting ring with minimum thickness of 2 inches meeting ASTM C478 may be used in lieu of bricks.
- 2.3 **MORTAR:** Composed of one part portland cement and two parts sand (volumetric measure) thoroughly mixed in a tight box, with water added gradually and mixed continually until mortar has attained the proper consistency for use in brick masonry; prepared only in such quantities as needed for immediate use; mortar mixed for more than 30 minutes, retempered, or previously set will not be allowed.
- 2.4 **GRAY IRON CASTINGS:** Cast iron conforming to the requirements of Class 30, ASTM A48; made accurately to the required dimensions; sound, smooth, clean, and free from blisters and other defects; not plugged or otherwise treated to remedy defects; machined so that covers rest securely in the frames with no rocking and are in contact with frame flanges for the entire perimeter of the contact surfaces; thoroughly cleaned subsequent to machining and, before rusting begins, coated with a smooth tough asphaltic coating, and with the actual weight in pounds stenciled or printed by the manufacturer on each casting in white paint. Castings shall be John Bouchard 1155 for non traffic areas or 1150 for traffic areas. Watertight castings shall be John Bouchard 1123. The cover shall be of the solid indented type with the words "WASTEWATER" cast in raised letters thereon.
- 2.5 **PLASTIC GASKET FOR PRECAST MANHOLES:** Preformed plastic gasket shall meet or exceed all requirements of FS SS-S-00210, 210-A, "Sealing Compound, Preformed Plastic for Pipe Joints," Type I, rope formed. The sealing compound shall be produced from blends of refined hydrocarbon

resins and plasticizing compounds reinforced with inert mineral filler and shall contain no solvents, irritating fumes, or obnoxious odors. The compound shall not depend on oxidizing, evaporating, or chemical action for its adhesive or cohesive strength. It shall be supplied in extruded rope form of suitable cross section and in such sizes as to seal the joint space when the manhole sections are installed. The sealing compound shall be protected by a suitable removable 2 piece wrapper, which shall be designed so that half may be removed longitudinally without disturbing the other half in order to facilitate application of the sealing compound. The flexible plastic gasket shall also meet the requirements of the following table:

| Composition                         | Test Method | Minimum | Maximum |
|-------------------------------------|-------------|---------|---------|
| Bitumen (Petroleum Plastic Content) | ASTM D4     | 50      | 70      |
| Ash Inert Mineral Matter            | AASHTO T111 | 30      | 50      |
| Volatile Matter                     | ASTM D6     | --      | 2.0     |

| Property                                  | Test Method | Minimum    | Maximum |
|---|-------------|------------|---------|
| Specific Gravity at 77 degrees F          | ASTM D71    | 1.20       | 1.30    |
| Ductility at 77 degrees F (cm)            | ASTM D113   | 5.0        | ----    |
| Softening Point                           | ASTM D36    | 320 deg. F | ----    |
| Penetration 77 degrees F (150 gms) 5 sec. | ASTM D217   | 50         | 120     |

- 2.6 **MANHOLE STEPS:** No. 4 (GR.60) steel reinforcing rod encapsulated in polypropylene plastic equal to No. PS 1-45 as manufactured by M. A. Industries, Inc. Width shall be 12 inches. The steps shall be aligned in each manhole section so as to form a continuous ladder with rungs equally spaced vertically in the assembled manhole at a maximum design distance of 16 inches. Steps are to be placed in a manner such that the steps are not placed over any pipes entering the manhole.

## 2.7 **PRECAST MANHOLE COMPONENTS**

- 2.7.1 Meeting the requirements of the standard drawings and ASTM C478. The manhole sidewall shall be of a length such that an adjusting ring a minimum of 2 inches and a maximum of 12 inches shall be placed on top of the unit to bring the casting to grade. In no instance shall adjusting rings exceed 12 inches in height. The adjusting ring shall conform to the height ranges specified. The outside of the manhole shall be sealed with 2 coats of Tnemec

Series 20. In manholes where force mains enter a manhole, the interior shall also be coated. Preparation shall be with Series 63-1500 filler and surfacer. The first coat shall be Series 20-1255 at 3 - 5 mils DFT. The second coat shall be WH-02 at 4 - 6 mils DFT. Precast manholes are to be manufactured by Cloud or Lee Masonry Products, Inc.

- 2.7.2 Adjusting rings to be of precast concrete only. PE and steel adjusting rings are not acceptable.

## 2.8 **MANHOLE CONNECTORS**

- 2.8.1 New Manholes: A resilient connector molded from a neoprene compound meeting the requirements set forth in ASTM C443. The connector shall be Kor-N-Seal I with Korband Expander or PSX Series Six.

- 2.8.2 Existing Manholes: When connections are required on existing manholes, the manhole shall be cored and a resilient connector as specified for new manholes shall be used. If the material of the existing manhole is such that a clean core cannot be made, then a waterstop gasket of polyisoprene compound that meets or exceeds the requirements of ASTM C443, with stainless steel take-up clamps may be used with the prior approval of the Wastewater Department. The gasket shall be Style WS-25 (1-1/2 inches - 6 inches) and WS-30 (for 8 inches and larger) manufactured by Press Seal Gasket Corp., or equal.

- 2.9 **MATERIAL TESTING:** All precast reinforced concrete manhole risers, bases, and tops specified herein shall be tested and inspected by a commercial testing laboratory approved by the City of Franklin or the Field Representative prior to delivery to the site, and all materials that fail to conform to these specifications shall be rejected. After delivery to the site, any materials that have been damaged in transit or are otherwise unsuitable for use in the work shall be rejected and removed from the site. Supply certified copies in duplicate of the inspection and acceptance reports of the testing laboratory to the Field Representative before using the materials. The commercial testing laboratory shall be engaged and paid for by the Contractor. Submit a certificate from the manufacturer of the castings indicating that they meet all applicable requirements of these specifications.

## PART 3 EXECUTION

- 3.1 Dewater sufficiently to maintain the ground water level below the bottom of the manhole foundation prior to and during placement of the foundation.
- 3.2 Obtain an adequate foundation for all manhole structures by removing and replacing unsuitable material with well graded granular material, by tightening with coarse rock, or by such other means as provided for foundation



preparation of the connected wastewater or as directed by the Wastewater Department. Wherever water is encountered at the site, place all cast-in-place bases on a one-piece waterproof membrane to prevent any movement of water into the fresh concrete.

- 3.3 For cast-in-place manhole bases, carefully block the lower barrel section above the prepared surface so that it is fully and uniformly supported in true alignment; make sure that all entering pipe can be inserted at proper grade. Then place the concrete foundation and invert under and upon this base section as shown in the standard drawings. For monolithic manhole bases, carefully level the base stone and place the base section on this prepared base so it is fully and uniformly supported in true alignment and elevation.
- 3.4 Thoroughly wet and then completely fill all lift holes with mortar. Trim all protruding mastic between precast elements and between the manhole casting and the manhole riser on the inside of the manhole and smooth over these joints with mortar.
- 3.5 Construct poured in place concrete manholes and bases of 4,000 psi concrete in accordance with the provisions of this section and applicable provisions of Section 03303, Concrete for Utility Lines. The ladder bars shall be cast-in-place. The Wastewater Department may require a submittal on concrete mix design for approval and a certification of concrete mix from the supplier. The base shall have a minimum diameter of 8 inches greater than the outside diameter of the manhole with a minimum thickness of 9 inches. The barrel shall have a minimum thickness of 6 inches for 4 feet diameter manholes. Any height adjustments must also be poured in place in the barrel section of the manhole.
- 3.6 Carefully set the cast iron frame for the cover at the required elevation, and properly bond it to the masonry with preformed plastic gasket. Wherever manholes are constructed in paved areas, tilt the top surface of the frame and cover so as to conform to the exact slope, crown, and grade of the existing adjacent pavement. Wherever manholes are constructed in new subdivision streets, set the top surface of the frame and cover so as to conform to the exact slope, crown, and grade of the proposed finished surface. Slope asphalt from the top of the casting to the pavement surface for a distance of 1 foot all around the casting.
- 3.7 Manhole inverts shall be constructed at the plant or field constructed of concrete to the approximate cross section of the wastewater connected to them. Make any necessary changes in cross sections gradually from side to side of the manhole; make changes in direction of flow of the wastewater to a true curve of as large a radius as is permitted by the size of the manhole.

- 3.8 All connections of the wastewater pipe to new manhole sidewalls shall be made with resilient connectors. Openings in the manhole sidewall for the pipe shall be precast or cored to provide required size and location. The hole shall be manufactured to allow for lateral and vertical movement, as well as angular adjustments through 20 degrees. A resilient connector between the manhole and pipes shall be installed in the precast or cored openings. An external band made entirely of corrosion resistant stainless steel shall be used to effect the seal around the pipe.
- 3.9 The void between the pipe and the connector shall be filled with an approved flexible gasket material.
- 3.10 Where the difference in the invert elevation of two or more wastewater lines intersecting in one manhole is 24 inches or more, construct a drop manhole. Drop manholes shall be similar in construction to standard manholes except that a drop connection of pipe and fittings of the proper sizes and materials shall be constructed outside the manhole and supported by 4,000 psi concrete as indicated by the standard drawings.
- 3.11 Place backfill by hand around the manhole and to a distance of at least one pipe length into each trench, and tamp the downstream side with clean 1/2 inch to 3/4 inch crushed stone up to an elevation of 12 inches above the crown on all entering pipes. Continue backfilling in accordance with the requirements for trench backfilling.
- 3.12 All lifting holes shall be filled and pointed with non-shrink grout for concrete manholes.
- 3.13 All pipes and other openings into the manhole shall be suitably plugged in such a manner as to prevent displacement of the plugs while the vacuum is pulled. Service lines at manholes may be vacuum tested in lieu of air testing at the option of the Contractor and approved by the Field Representative.
- 3.14 The Contractor is required to furnish all equipment necessary for these tests including the manhole sealing apparatus, gauges, pump plugs, and personnel shall be in accordance with equipment specifications and instructions provided by the manufacturer.
- 3.15 Exterior manhole surfaces shall be coated with waterseal material. The manholes shall be coated with at least two coats of sealant; one grey coat and one white coat of Portland cement slurry, similar or equal to Drycon Grey and Drycon White, which will prevent seepage of water through manhole wall under hydrostatic pressure. Coats must be able to withstand a hydrostatic pressure of 7psi (16 feet of water). Thoroughly wet and then completely fill all lift holes and all joints between precast elements with mortar. Smooth and coat joints both inside and outside to insure watertightness.

- 3.16 The test head shall be placed in the cone section of the manhole.
- 3.17 A vacuum of 10 inches of mercury shall be drawn. The time for the vacuum to drop to 9 inches of mercury shall be recorded.
- 3.18 Acceptance for 4 foot diameter manholes shall be defined as when the time to drop to 9 inches of mercury meets or exceeds the following:

| <u>Manhole Depth</u> | <u>Diameter</u> | <u>Time to Drop 1 Inch HG</u> |
|----------------------|-----------------|-------------------------------|
| 10 ft. or less       | 4 ft.           | 75 seconds                    |
| 10 ft. to 15 ft.     | 4 ft.           | 90 seconds                    |
| 15 ft. to 25 ft.     | 4 ft.           | 105 seconds                   |

- 3.19 For manholes 5 foot in diameter, add an additional 15 seconds and for manholes 6 foot in diameter, add an additional 30 seconds to the time requirements for 4 foot diameter manholes.
- 3.20 If the manhole fails the test, necessary repairs shall be made and the vacuum test repeated until the manhole passes the test.
- 3.21 If the manhole joint mastic is displaced enough to leave a void between the sections during the vacuum test, the manhole shall be disassembled and the seal replaced.
- 3.22 The vacuum test will be conducted after the manhole casting has been set and the binder placed around it. No standing water shall be allowed in the manhole excavation which may affect the accuracy of the test.
- 3.23 Regardless of the outcome of the vacuum tests, any visual or audio defects are to be repaired as directed by the Field Representative.

END OF SECTION

## CHAPTER 4

### WASTEWATER - FORCE MAIN

#### PART 1 GENERAL INFORMATION

- 1.1 Furnish all material, equipment, tools, and labor in connection with the sewage force main, complete and in accordance with the drawings and these specifications. Pipe material for 4 inches and larger shall be ductile iron and material for 3 inches and smaller shall be PVC.
- 1.2 It shall be the Contractor's responsibility to ensure that all necessary materials are furnished to him and that those found to be defective in manufacture are replaced at no extra cost to the Wastewater Department. Materials damaged in handling after being delivered by the manufacturer shall be replaced at the Contractor's own expense. If installed material is found to be defective before the final acceptance of the work, the cost of both the material and labor needed to replace it shall not be passed on to the Wastewater Department.
- 1.3 The Contractor shall be responsible for safely storing materials needed for the work that have been accepted by him until they have been incorporated into the completed project. Keep the interiors of all pipes, fittings, and other accessories free from dirt and foreign matter at all times.
- 1.4 Refer to other sections for work related to that specified by this section. Coordinate this work with that required by other sections for timely execution.

#### PART 2 PRODUCTS

##### 2.1 DUCTILE IRON PIPE AND FITTINGS

- 2.1.1 Ductile iron pipe shall conform to the requirements of ANSI 21.51/AWWA C151 for ductile iron pipe centrifugally cast in metal or sand-lined molds. It shall be made and tested in accordance with ASTM A536.
- 2.1.2 The pipe shall be plain end and ductile iron pipe with push-on, single gasket joints. The design thickness shall be that specified by ANSI A21.50/AWWA C150 except that all pipe with a diameter of 12 inches or less shall be of Pressure Class 350 and all pipe with a diameter of 14 inches to 36 inches shall be of Pressure Class 300 unless determined otherwise by the Wastewater Department.
- 2.1.3 The length of each individual piece of ductile iron pipe shipped must be plainly marked on that piece of pipe.

- 2.1.4 The push-on single gasket joints shall be either "Fastite" (by American Cast Iron Pipe Company), "Tyton" (by U.S. Pipe and Foundry Company), or "Super Bell-Tite" (by McWane or Griffin).
- 2.1.5 The bell of each pipe shall have a tapered annular opening and a cast or machined retaining groove for the gasket. The gasket groove shall have a flared design so that maximum deflection will be provided. The plain spigot end of the pipe shall be beveled in order to simplify its entry into and centering within the bell and the compression of the gasket.
- 2.1.6 The gasket shall be of high quality vulcanized rubber made in the form of a solid ring to exact dimensions. The design of the gasket groove in the bell of the pipe and the design, hardness, and other properties of the gasket itself shall be such that the joint is liquid tight for all pressures from a vacuum to the maximum internal liquid pressure of 350 psi.
- 2.1.7 Enough lubricant shall be furnished with each order to provide for the proper installation of the pipe supplied with said order. This lubricant shall be shall be nontoxic, impart no taste or smell, and have no harmful effect on the rubber gasket. It shall have a consistency that will allow it to be easily applied to the pipe in either hot or cold weather and that will enable it to adhere to either wet or dry pipe.
- 2.1.8 Standard and special fittings shall be ductile iron. Use standard mechanical joint fittings unless otherwise shown on the Drawings. All fittings shall conform to ANSI A21.10/AWWA C110.
- 2.1.9 Pipe and pipe fittings shall have Protecto 401 Ceramic Epoxy Coating 40 mils DFT, Duro Plus lining or equal, in accordance with the manufacturer's standard procedures.

## **2.2 DETECTABLE TAPE**

- 2.2.1 Detectable tape, if required by the City, shall be 2 inches wide and shall be an inert, bonded layer plastic with a metallized foil core and shall be highly resistant to alkalis, acids, or other destructive chemical components likely to be encountered in soils. The tape shall be brightly colored to contrast with soil and shall bear the imprint "CAUTION WASTEWATER LINE BURIED BELOW."

## **2.3 AIR RELEASE VALVES AND COMBINATION AIR RELEASE VALVES**

- 2.3.1 Air release valves on force main larger than 3 inches shall be APCO 400 sewage valve with stainless steel floats and rods with bronze plugs and valves, all in accordance with the standard drawings. Combination valves to be similar except to be APCO 445 combination wastewater valves.

## PART 3 EXECUTION

### 3.1 INSTALLATION OF FORCE MAIN

- 3.1.1 Lay the force main to and keep it at the lines and grades required by the drawings. All fittings shall be at the required locations, and spigots well centered in the bells. Where the grades are 0.2% or less, use a laser to maintain the required slopes.
- 3.1.2 Force mains 4 inches and larger, unless otherwise indicated by the drawings, shall have at least 36 inches of cover. The pipe shall slope continuously between high and low points and have a minimum of 60 inches cover at the high points. No departure from this policy shall be made except by order of the Wastewater Department.
- 3.1.2.1 For low pressure sewer force mains, the force main shall generally follow the contours of the ground, sloping continuously between high and low points. All pipe shall have a minimum cover of 36 inches unless otherwise shown on the drawings. Any variation therefrom shall be made only at the order of the Wastewater Department.
- 3.1.3 Provide and use tools and facilities that are satisfactory to the Wastewater Department and that will allow the work to be done in a safe and convenient manner. Use a derrick, ropes, or other suitable equipment to lower all pipe and fittings into the trench one piece at a time. Carefully lower each piece so that neither it nor any protective coating or lining it may have will be damaged. Under no circumstances, drop or dump force main materials into the trench.
- 3.1.4 Lower no pipes and fittings into the trench until they have been swabbed to remove any mud, debris, etc., that may have accumulated within them. After the pipe has been lowered, remove all unnecessary materials from it. Before any pipe is laid, brush and wipe clean the outside of its spigot end and the inside of its bell and ensure that the pipe is dry and oil-free.
- 3.1.5 Take every precaution to keep foreign material from getting into the pipe while it is being placed in the line. If the crew laying the pipe cannot put it into the trench and in place without allowing earth to get inside it, then place a heavy, tightly woven canvas bag of suitable size over each end of the pipe and leave it there until it is time to connect that pipe to the one adjacent to it.
- 3.1.6 Place no debris, tools, clothing, or other materials in the pipe during laying operations.

- 3.1.7 After a length of pipe has been placed in the trench, center the spigot end in the bell of the adjacent pipe, and then insert to the depth specified by the manufacturer and bring to the correct line and grade. Secure the pipe in place by tamping an approved backfill material around it.
- 3.1.8 Whenever pipe laying is not in progress, close the open ends of pipe in the trench with a watertight plug or by other means approved by the Wastewater Department. This shall be done not only at the end of each working day but also before work is stopped for lunch periods, bad weather, or any other reason. If there is water in a trench, this seal shall remain in place until the trench has been pumped completely dry.
- 3.1.9 The cutting of pipe so that fittings or closure pieces can be inserted shall be done in a neat and workmanlike manner and without any damage to the pipe. Follow the manufacturer's recommendations concerning how to cut and machine the ends of the pipe in order to leave a smooth end at right angles to the pipe's axis.
- 3.1.10 The flame cutting of pipe by means of an oxyacetylene torch will not be allowed.
- 3.1.11 Unless otherwise directed by the Wastewater Department, lay pipe with the bell ends facing in the direction of laying.
- 3.1.12 Wherever pipe must be deflected from a straight line (in either the vertical or horizontal plane) in order to avoid obstructions, or wherever long radius curves are permitted, the amount of deflection shall not exceed that necessary for the joint to be satisfactorily made, nor that recommended by the pipe manufacturer, and shall be approved by the Wastewater Department.
- 3.1.13 Lay no pipe in water or when it is the Wastewater Department's opinion that trench conditions are unsuitable. If crushed stone is used to improve trench conditions or as backfill for bedding the pipe, this shall be considered incidental to the project, and no separate payment will be made for its use.
- 3.1.14 Install thrust blocks wherever the force main changes direction (e.g., at tees and bends), at dead ends, or at any other point where the manufacturer recommends and/or the Wastewater Department indicates that they are to be used.
- 3.1.15 Make all joints, whether standard mechanical, push-on, or solvent weld joints, in conformance with the recommendations of the joint manufacturer as approved by the Wastewater Department.
- 3.1.16 Install a sewage air release and/or air vacuum valve at all high points.

- 3.1.17 Test all force main in accordance with the provisions of Section 13 of AWWA C600. For the pressure test, subject the force main to a pressure of 200 psi; for the leakage test, to a pressure of 160 psi. If the testing reveals any cracked or defective pipes, fittings, or valves, replace them with sound material, and then repeat the testing until the results are satisfactory to the City of Franklin.
- 3.1.18 Perform all tests and provide all labor, equipment, etc., needed to do so at no extra cost to the Owner.
- 3.1.19 After completing each section of force main, remove all debris and all construction materials and equipment from the work site. Then grade and smooth over the surface on both sides of the main. The entire area shall be clean and left in a condition satisfactory to the design of the City of Franklin or the Wastewater Department.
- 3.1.20 The detectable tape, if required, shall be buried in the utility line trench directly above the installation to be identified. A vertical distance of approximately 12 inches between the installation and the marking tape shall be provided. The tape shall be placed in the trench with the printed side up, and be essentially parallel to the finished surface. The Contractor will take necessary precautions to ensure that the tape is not pulled, distorted, or otherwise misplaced in completing the trench backfill. Tape will be placed in all trenches above all nonmetallic pipe used, both main and service lines.

## **3.2 HYDROSTATIC TESTS**

### **3.2.1 PRESSURE TEST**

- 3.2.1.1 After pipe has been laid and backfilled as specified above, subject all newly laid pipe or any valved section thereof to a pressure of 200 psi. All services are to be laid prior to testing the main and tested as part of the test of the main.
- 3.2.1.2 The duration of each pressure test shall be at least two hours. The specified pressure shall not vary more than 5 psi during this test.
- 3.2.1.3 Slowly fill each valved section of pipe with water, and apply the specified test pressure (based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gage) with a positive displacement pump connected to the pipe in a manner satisfactory to the City of Franklin. This pipe shall be filled 24 hours prior to testing. Furnish the pump, pipe, connections, gages, and all necessary apparatus.
- 3.2.1.4 Before applying the specified test pressure, expel all air from the pipe. If blowoffs are not available at high places, make the necessary taps at the



points of highest elevation before testing, and insert plugs after the test has been completed.

3.2.1.5 Carefully examine all exposed pipes, fittings, and valves during the test. Remove any cracked or defective pipes, fittings, or valves discovered in consequence of this pressure test, and replace with sound material in the manner specified. Repeat the test until the results are satisfactory to the Wastewater Department.

3.2.1.6 Should the Contractor be unable to obtain a satisfactory pressure test over a duration of two hours, he shall then be required to perform a leakage test.

### 3.2.2 **LEAKAGE TEST**

3.2.2.1 Begin the leakage test immediately after the pressure test after unsatisfactory completing pressure test. Furnish the pump, pipe, connections, gauges, measuring devices, and all other necessary apparatus as well as all necessary assistance to conduct the test.

3.2.2.2 The duration of each leakage test shall be 24 hours; during the test, subject the main to a pressure of 160 psi.

3.2.2.3 Leakage is defined as the amount of water which must be supplied to the newly laid pipe or any valved section in order to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled.

3.2.2.4 No pipe installation will be accepted until the leakage is less than the number of gallons per hour period listed below:

| Pipe Sizes<br><u>(Inches)</u> | Gal. per 1,000 Feet<br><u>of Pipe</u> |
|-------------------------------|---------------------------------------|
| 1-1/2 - 2-1/4                 | 0.2                                   |
| 3                             | 0.3                                   |
| 4                             | 0.4                                   |
| 6                             | 0.6                                   |
| 8                             | 0.8                                   |
| 10                            | 1.0                                   |
| 12                            | 1.1                                   |
| 14                            | 1.3                                   |
| 16                            | 1.5                                   |
| 18                            | 1.7                                   |
| 20                            | 1.9                                   |
| 24                            | 2.2                                   |
| 30                            | 2.8                                   |

- 3.2.2.5 Should any test of pipe laid disclose leakage greater than that specified, the Contractor shall, at his own expense, locate and repair the defective joints until the leakage is within the specified allowance.

### 3.3 **CLEANUP**

- 3.3.1 After completing each section of force main, remove all debris and all construction materials and equipment from the work site. Then grade and smooth over the surface on both sides of the main. The entire area shall be clean and left in a condition satisfactory to the design of the City of Franklin or the Wastewater Department.

END OF SECTION

## CHAPTER 4

### PRESSURE WASTEWATER VALVES

#### PART 1 GENERAL INFORMATION

- 1.1 Refer to other sections, Pressure Service Assemblies, Section 02719 and Unclassified Excavation for Utilities, Section 02222, for related work specified, furnished or installed under this heading.

#### PART 2 PRODUCTS

##### 2.1 **BALL VALVES**

- 2.1.1 Valves on PVC sewage force main 1-1/2 inches through 3 inches shall be a true union PVC ball type. Working pressure at 70 degrees F shall be 150 pounds per square inch. Valves shall be supplied with O-ring seals and shall open to the left. The valve shall be as manufactured by Asaki/America, GF Plastic System, Inc., Hayward Manufacturing Company, Inc., or Nibco Chemtrol TU Series.

##### 2.2 **AIR RELEASE VALVES AND COMBINATION AIR RELEASE VALVE**

- 2.2.1 Air release valves for 3 inches and smaller sewage force mains shall be similar and equal to APCO Model 200A Sewage Valve, Crispin Type P Sewage Valve, complete with 2 inch shut off valve, all in accordance with the drawings. The combination air release valve shall be APCO No. 142C or Valmatic Model 201C. All floats shall be heavy stainless steel, hermetically sealed.

##### 2.3 **VALVE BOXES**

- 2.3.1 Boxes shall be of concrete with a solid one piece cast iron cover as manufactured by Southern Meter Box. The boxes shall be heavy duty suitable for traffic and of the approximately size and depth as shown on the standard drawing. A minimum 2-1/2 inch diameter 16 gauge steel reflector shall be applied to the underside of the fiber cover for electronic detection.

#### PART 3 EXECUTION

##### 3.1 **LOCATION OF VALVES**

- 3.1.1 Valves in sewage force mains shall be located where shown on the plans.

##### 3.2 **VALVE BOXES AND VALVE PITS**

- 3.2.1 A valve box shall be provided for every valve and/or cleanout.
- 3.2.2 The valve box shall not transmit shock or stress to the valve or pipe and shall be centered and plumb over the wrench nut of the valve or cleanout, set the box cover flush with the surface of the finish pavement, or approximately 1/2 inches above the ground surface or such other level as may be directed.

END OF SECTION

## CHAPTER 4

### PREFABRICATED WET WELL MOUNTED WASTEWATER PUMP STATION

#### PART 1 GENERAL

##### 1.1 SUMMARY OF WORK

- A. Work Included: Provide all labor, materials, tools, and equipment to furnish f.o.b. jobsite a factory built, packaged, automatic wastewater pumping system complete with control panel, and enclosure, ready for installation by Contractor.
- B. Work Not Included: Construction of below grade wet well and installation of packaged wastewater pumping system.
- C. Refer to other sections for items affecting the prefabricated wet well mounted wastewater pump station.

##### 1.2 QUALITY ASSURANCE

- A. Reference Standards: The package wastewater pumping system construction shall comply with the applicable provisions and recommendations of the following:
  - 1. Hydraulic Institute Standard
  - 2. National Electrical Manufacturers Association (NEMA)
  - 3. National Electric Code (NEC)
  - 4. Underwriters Laboratory (UL)
- B. Qualifications of Manufacturers: Manufacturers of products submitted for approval shall be companies, corporations, or firms regularly engaged in the manufacture of complete packaged wastewater pumping systems with a history of successful production for a minimum period of twenty (20) years. The manufacturer of products used in the Work of this Section shall have a minimum of ten (10) similar installations, at different locations, completed in the U.S. and/or Canada during the past five (5) years. Installation shall be considered similar only if they are comprised of the same basic equipment and design. A minimum of five (5) installations shall have successfully fulfilled the same primary function for at least thirty (30) months at the time of submittal.

### 1.3 SUBMITTALS

- A. Submit all information about the proposed prefabricated pump station and all equipment included in it, in accordance with Section 01301, Equipment Submittals.
- B. Prior to fabrication, pump station manufacturer shall submit seven copies of submittal data for review and approval. Submittal shall include shop catalog cut sheets, drawings, electrical ladder logic drawings, and support data as follows:
  - 1. Catalog cuts sheets reflecting characteristics for major items of equipment, materials of construction, major dimensions, weight, motor and v-belt drive data, pump characteristic curves showing the design duty point capacity (GPM), head (FT), net positive suction head required (NPSH), and hydraulic brake horsepower (BHP).
  - 2. Electrical components used in the motor branch and liquid level control circuits shall be fully described.
  - 3. Shop Drawings: Shop drawings shall provide layout of mechanical equipment and anchor bolt locations for station. Pipe penetrations and station access clearances shall be DEMENSIONED relative to the station centerline.
  - 4. Electrical ladder logic drawings: Electrical ladder logic diagrams shall illustrate motor branch and liquid level control circuits to extent necessary to validate function and integration of circuits to form a complete working system.
  - 5. Electrical schematic diagram of the pump station circuits shall be in accordance with NFPA 70. Schematics shall illustrate, to the extent of authorized repair, pump motor branch, control and alarm system circuits including interconnections. Wire numbers and legend symbols shall be shown. Schematic diagrams for individual components, not normally repairable by the station operator, need not be included. Details for such parts shall not be substituted for an overall system schematic. Partial schematics, block diagrams, and simplified schematics shall not be provided in lieu of an overall system diagram.
  - 6. Mechanical layout drawing of the pump station and components, prepared in accordance with good commercial practice, shall provide installation dimensions and location of all pumps, motors, valves and piping.

7. Certified Pump Test: Each pump shall be factory tested by the manufacturer for capacity, power requirements and efficiency at specified minimum operating head, rated head, shutoff head and at as many other points as are necessary to provide certified pump performance curves. Certified pump performance curves shall be submitted to the Engineer for approval.
- C. With delivery of packaged wastewater pumping system, the manufacturer shall provide seven (7) copies of
1. Operations and Maintenance Manuals: Comprehensive instructions supplied at time of shipment shall enable personnel to properly operate and maintain all equipment supplied. Content and instructions shall assume operating personnel are familiar with pumps, motors, piping and valves, but lack experience on exact equipment supplied.
  2. Documentation shall be specific to the pump station supplied and collated in functional sections. Each section shall combine to form a complete system manual covering all aspects of equipment supplied by the station manufacturer. Support data for any equipment supplied by others, even if mounted or included in overall station design, shall be provided by those supplying the equipment. Instructions shall include the following as a minimum:
    - a. Functional description of each major component, complete with operating instructions.
    - b. Instructions for operating pumps and pump controls in all modes of operation.
    - c. Calibration and adjustment of equipment for initial start-up, replacement of level control components, or as required for routine maintenance.
    - d. Support data for commercially available components not produced by the station manufacturer, but supplied in accordance with the specifications, shall be supported by literature from the prime manufacturer and incorporated as appendices.
    - e. Electrical schematic diagram of the pump station circuits shall be in accordance with NFPA 70. Schematics shall illustrate, to the extent of authorized repair, pump motor branch, control and alarm system circuits including interconnections. Wire numbers

and legend symbols shall be shown. Schematic diagrams for individual components, not normally repairable by the station operator, need not be included. Details for such parts shall not be substituted for an overall system schematic. Partial schematics, block diagrams, and simplified schematics shall not be provided in lieu of an overall system diagram.

- f. Mechanical layout drawing of the pump station and components, prepared in accordance with good commercial practice, shall provide installation dimensions and location of all pumps, motors, valves and piping.
- 3. Operation and maintenance instructions which rely on vendor cut-sheets and literature which include general configurations, or require operating personnel to selectively read portions of the manual shall not be acceptable. Operation and maintenance instructions must be specific to equipment supplied in accordance with these specifications.

#### 1.4 **WARRANTY**

- A. **Materials and Workmanship:** The manufacturer shall provide a written guarantee for all materials and workmanship extending eighteen (18) months after acceptance of delivery of the equipment by the Owner or one (1) year after start-up, which ever is shorter. All materials, equipment, and workmanship furnished under this Section shall be free from defects in material and workmanship. The manufacturer shall repair or replace, at his own expense, any defective equipment which fails to meet the specified design requirements which are revealed during demonstration, acceptance testing, and start-up. Repair or replacement of any such equipment shall be completed within twenty-one (21) calendar days at no expense to the Owner.
- B. **Performance:** The manufacturer shall provide a written guarantee that the supplied equipment will satisfy the performance standards specified herein.

### PART 2 PRODUCTS

#### 2.1 **GENERAL**

- A. Packaged wastewater pumping systems as manufactured by Smith& Loveless, Inc., and Gorman-Rupp respectively. Terminology used may include reference to that manufacturer's performance and product. Such reference shall be construed only as establishing quality of materials and workmanship to be used under this Section. It shall not in any way, be construed as limiting competition.



## 2.2 SYSTEM DESCRIPTION

- A. The packaged wastewater pumping system provided as required by this Specification shall be a complete, factory built stand alone, pumping system with an enclosure suitable for above-ground outdoor installation, and shall include an emergency “quick connect” coupling, as specified by the City.
- B. The complete packaged wastewater pumping system shall include pumps, motors, valves, piping, controls, sensors, electrical wiring, and control wiring.
- C. The packaged wastewater pumping system shall be delivered pre-assembled and on a single skid requiring only connection of suction piping, discharge piping, electrical service, and termination of instrumentation and control wiring.
- D. Emergency supplemental power shall be provided as directed by the City of Franklin.

## 2.3 DESIGN REQUIREMENTS

- A. Operating Conditions:
  - 1. Ambient Air Temperature
    - Maximum 105 F
    - Minimum 10 F
  - 2. Outdoor Continuous Service
  - 3. Altitude 600 ft msl
- B. Electrical Service: Electrical service provided at the pump station site shall be 480 V, 3 phase, 60 cycle, 4 wire service as provided by the local electric utility.

## 2.4 SERVICE AND CAPACITY

- A. Packaged wastewater pumping system must be designed to handle raw, unscreened, domestic sanitary sewage. The packaged wastewater pumping system shall provide unattended, alternating duplex pump operation.

## 2.5 SYSTEM COMPONENTS

- A. Pumps: The packaged wastewater pumping system shall have two (2), non-clog, self-priming centrifugal pumps especially designed to operate with mechanical seals and vacuum priming. Each pump shall be capable of delivering the required flow under the design conditions. It shall be complete with pump pedestal, motor adapter, coupling, and motor. Pump flanges shall be faced and drilled similar to ANSI Class 125 flanges.
- B. All openings and passages shall be large enough to permit the passage of a sphere 3 inches in diameter and any trash or stringy material that can pass through a 4 inch house collection system.
- C. Pump casing, bearing housing, pump pedestal, and motor adapter shall be of close grained cast iron, ASTM A48, Class 30, and shall be machined and of tongue and groove construction.
- D. Pump Base: Each pump shall be supported by a heavy cast iron base.
- E. Pump Impeller: The pump impeller shall be of the semi-open or enclosed type made of close grained cast iron, ASTM A48, Class 30, or ductile iron and shall be statically and dynamically balanced.
- F. Pump Bearings: Each pump shall have 2 sets of bearings. Bearings shall be designed for the combined thrust and radial load. These bearings shall be spaced so that the distance between them is greater than the distance between the center of the impeller and the first bearing. The bearings shall be mounted in a dustproof and moisture proof housing that is bolted to the pump casings to ensure permanent alignment. Alemite fittings shall be furnished at each ball bearing for grease lubrication.
- G. Maintenance Access: The pump shall be arranged so that the rotating element can be easily removed from the volute without disconnecting the seal system or electrical wiring. The pump shall be arranged so that any foreign object may be removed from the pump or suction elbow without disassembling the motor, impeller, or back head.
- H. Mechanical Seal: The pump shaft shall be sealed against leakage by a single mechanical seal constructed so as to be automatically drained and primed each time the pump is drained and primed. Water that lubricates the mechanical seal shall be automatically drained from around the seal if the pump loses prime in order to allow both the pump and the seal to be drained, thereby preventing freezing and breakage of the seal during power outages in subfreezing temperatures.

- I. The seal shall be of carbon and ceramic materials with the mating surfaces lapped to a flatness tolerance of one light band. The rotating ceramic ring shall be held in mating position with the stationary carbon ring by a stainless steel spring.
- J. Priming System: Each wastewater pump shall be self-priming or equipped with a vacuum priming system. Each wastewater pump shall be capable of priming the pump and suction piping in not more than 60 seconds under a rated static suction lift conditions of 24 feet.
- K. The priming system shall automatically provide positive lubrication of the mechanical seal each time the wastewater pump is primed. To prevent excessive stoppage due to grease accumulation, no passageway in the priming system through which wastewater must pass shall be smaller than a 2-1/2 inch opening.

## 2.6 MOTORS

- A. Performance: The motors shall be a high efficiency NEMA Design B, open drip proof, squirrel cage induction type, with class F insulation and 1.15 Service Factor. They shall have normal starting torque and low starting current characteristics. The motors shall not be overloaded beyond the nameplate rating at the design head nor beyond the nameplate rating times the manufacturer's service factor at any head in the operating range.
- B. Shaft: The motor shaft shall be strong and stiff enough for the service intended, and its diameter shall equal or exceed that of the wastewater pump shaft at all points from immediately below the top of the impeller hub. Motor shaft shall be supported on heavy grease lubricated ball bearings, at least one of which shall be a combination guide and thrust bearing.
- C. Lifting Eyes: The motors shall be fitted with heavy lifting eyes, each capable of supporting the entire weight of the motor.
- D. The maximum allowable speed of the motor shall be 1,760 rpm.

## 2.7 PIPING

- A. Discharge Piping: The discharge line from each pump shall be fitted with a clapper check valve and common eccentric 3 way plug valve. The sizes and locations of check valves and plug valves installed shall be subject to the Engineer's approval. The discharge check valve shall be of the spring loaded type with an external lever arm and a resilient seat. An operating wrench shall be provided for the plug valve.

- B. Protrusions through the floor plate shall be gas-tight where necessary to effect sealing between the equipment chamber and the wet well. Bolted and sealed joints shall be provided at the volutes or suction pipes in order to prevent corrosive, noxious fumes from entering the station. The pump station manufacturer shall extend the suction and discharge connections below the floor plate at the factory so that field connections can be made without disturbing the gas-tight seals.
- C. A compression type sleeve coupling shall be provided for installation in the common discharge pipe.
- D. Equipment Enclosure
  - 1. The equipment enclosure shall contain and protect all pumps, interior piping, and valves. Equipment enclosure shall consist of a base and enclosure cover.
  - 2. Equipment Cover: Equipment cover shall incorporate the following design and service features:
    - A. Access panels must be supplied on the enclosure location. Location and size of access panels shall permit access for routine maintenance functions such as pump and motor inspection, equipment adjustment, and pump clean-out. Panels shall be secured with tamper-proof hardware. A continuous hinge and latch shall be installed on access panels. Tamper-proof shall include match keyed locks requiring only one key to open all access panels.
    - B. A vent in one at least one access panel shall allow free air flow for enclosure ventilation.
    - C. The complete equipment cover, less base, must be completely removable after disengaging reusable tamper-proof hardware. After disassembly, no portion of the cover (except electrical service entrance) shall project above the base surface to interfere with maintenance or endanger personnel.
    - D. Disassembly and removal of the equipment cover shall require no more than two people working without assistance of lifting equipment.
    - E. Equipment cover shall be manufactured of molded reinforced orthophthalic polyester resins with a minimum of 30% fiberglass, and a maximum of 70% resin. Resin fillers or extenders shall not be used.

- F. All interior surfaces of the housing shall be coated with a finish providing maintenance-free service, abrasion resistance, and protection from sewage, greases, oils, gasoline, and other common chemicals.
- G. Outside surface finish of the cover shall be coated with a finish to ensure long maintenance-free life and UV protection. Color used shall de-emphasize the presence of dirt, grease, etc and shall be approved by the Owner.
- H. Major design consideration shall be given to structural stability, corrosion resistance, and watertight integrity. Cover must be impervious to micro-organisms, mildew, mold, fungus, corrosive liquids, and gases which are expected to be present in the environment surrounding the wet well.
- I. Enclosure Base: Enclosure base shall be constructed of pre-cast, reinforced concrete encapsulated in a fiberglass mold or minimum 3/8-inch thick steel. The design shall resist deformation of the structure during shipping, lifting, or handling. Base shall incorporate drainage provisions, and an opening sized to permit installation of piping and service connections to the wet well. After installation, the opening shall serve as a grout dam to be utilized by the contractor. The base shall incorporate anchor bolt recesses for securing the complete station to a concrete pad (supplied by the contractor) in accordance with the project plans.
- J. Ventilating Blower: A blower mounted in the station cover shall be sized to exchange station air volume at least once every two minutes or 250 scfm whichever is greater. Blower motor shall energize automatically at approximately 70 degrees F, and turned off at 55 degrees F. The blower motor control circuit shall incorporate a thermal-magnetic circuit breaker and manual fractional motor starter with integral overloads providing over current and overload protection. Exhaust and inlet locations shall prevent the entrance of rain, snow, or debris.

## **2.8 INSTRUMENTATION AND CONTROLS**

- A. Packaged wastewater pumping system shall be furnished with a complete controls and instrumentation system to provide stand-alone operation as well as transmitting data to a remote site. Instrumentation and controls shall provide for full functioning of wastewater pumping system without

other instrumentation and controls equipment once service connections are completed. Instrumentation and controls installation shall provide an interface for connection of remote monitoring system. All internal wiring, terminal blocks, and ancillaries shall be provided.

1. Control Panel: A local control panel shall be furnished with and mounted on each packaged wastewater pumping system skid. This panel shall have provisions for the operation of all equipment provided under this Section as well as other Owner supplied equipment as described in this specification. The control panel shall have provisions for interface, monitoring, and control with remote monitoring system. All connections to field devices or Owner supplied equipment shall be by terminal strip type connectors. All terminals shall be clearly marked and shown on the elementary diagrams supplied with the packaged wastewater pumping system.
  - a. The control panel shall be of NEMA 4X stainless steel design, comply with applicable National Electrical Code standards and provide the following control functions and local indication as a minimum:
    1. Control panel power service disconnect overload protection.
    2. Hand-Off-Auto operation of pumps.
    3. Run-time indicator for each pump registering totalize hours of operation to 10,000 hours.
    4. Run status for each pump.
    5. Liquid level in wet well in feet.
    6. Alarm indication for high liquid level and low liquid level in wetwell.
    7. Security alarm for unauthorized access to the packaged wastewater pumping system.
2. Indication Panel: An indication panel shall be included as part of the control panel to indicate operating conditions of the system. The indication panel shall contain 1 amber "power on" light, 2 white "pump required" lights, 2 green "pump running" lights, a 4-1/2 inch diameter flush mounted level gauge calibrated from 0 to 300 inches, 2 HAND/OFF/ AUTOMATIC selector switches for each pump, and the following individual red alarm lights:
  - a. Low wet well level alarm
  - b. High wet well level alarm
  - c. Level system failure alarm

3. Interface Terminations: Terminals, relays, and ancillaries for interface with remote monitoring system shall be provided for:
  - a. 4-20 mA input from Owner supplied water pressure transmitter.
  - b. Output for 4-20 mA signal from Owner supplied pressure transmitter.
  - c. Electric utility service failure.
  - d. Security alarm registration.
  - e. Low liquid level alarm in wet well.
  - f. High liquid level alarm in wet well.
  - g. Output for 4-20 mA signal for liquid level in wet well in feet.
  - h. Packaged wastewater pumping system Hand-Off-Auto switch setting.
  - i. 12 spare terminals for future use.
  - j. Pump No. 1 Running
  - k. Pump No. 2 Running
  - l. Pump No. 1 in HAND (Discrete Contact)
  - m. Pump No. 1 in AUTO (Discrete Contact)
  - n. Phase Reversal Lost Relay
  - o. Pump No. 1 Required
  - p. Pump No. 2 Required
  - q. Pump No. 2 in HAND (Discrete Contact)
  - r. Pump No.2 in AUTO (Discrete Contact)
- B. The circuit breakers, starter reset buttons, and control switches shall be operable without removing the access cover for deadfront operation.
- C. Circuit Breakers: Thermal magnetic air circuit breakers shall be provided for branch disconnect service and short circuit protection of all motor control and auxiliary circuits.
- D. Motor Starters: Magnetic across the line starters with under voltage release and overload coils for each phase shall be provided for each pump motor below 20 horse power to give positive protection. For motors 20 horsepower and greater solid state, reduced voltage starters shall be used. Starters shall include human interface modules (HIM'S) to allow full programming and monitoring by Owner. Reduced voltage starters shall be equal to an Allen Bradley 1336 Plus-HA2. Each single phase auxiliary motor shall be equipped with an overcurrent protection device in addition to the branch circuit breaker, or else be impedance protected. All switches shall be labeled, and a coded wiring diagram shall be provided.
- E. Electrical Panelboard: An electrical panelboard, mounted inside the control panel, shall be supplied with the packaged wastewater pumping system to provide 120 V single phase electrical service for manufacturer supplied equipment requiring 120 V single phase electric service. Four

spare 15 amp, 1-pole circuits in addition to those required for manufacturer supplied equipment shall be provided in that panelboard for Owner's use.

- F. Duplex Ground Fault Receptacles: Two duplex ground fault protected receptacles providing 115 VAC, 60 Hz, single phase current shall be mounted on the side of the control panel enclosure. Each receptacle circuit shall be protected by a 15 ampere thermal-magnetic circuit breaker.
- G. Electrical Service: Electrical service to control panel shall be 480V 3 phase 60 Hz service. Control panel shall include any equipment necessary to modify the supplied electrical service to operate the packaged wastewater pumping system. A 5 kva (minimum) 480-120/240 volt control/accessory transformer shall be included.
- H. Instrumentation and Controls Functioning: The instrumentation and control system shall provide for:
  - 1. Automatic alternating duplex operation of pumps.
  - 2. Pump operation be based on liquid level in the wet well. Operator adjustable level set points for:
  - 3. Wet Well Liquid Level:

|                   |                        |
|-------------------|------------------------|
| Low Low Low Level | Low liquid level alarm |
| Low Low Level     | Lag and Lead Pump Off  |
| Low Level         | Lead Pump On           |
| High Level        | Lag Pump On            |
| High High Level   | High Level Alarm       |
- I. Instrumentation/Control Equipment:
  - 1. Wet Well Liquid Level Measurement: Accurate control of the level in the wet well shall be made by a self-purging bubbler system or ultrasonic level sensor. Liquid level shall be measured to within 0.1 feet at a maximum interval of once each second.
  - 2. Wet Well Liquid Level Alarms: Low and high wet well liquid level alarms shall be determined using float switches. Wet well liquid level alarms shall not be determined by the same equipment used to measure wet well liquid level. Floats shall be sealed units. Float switches containing mercury shall not be acceptable. The low liquid level alarm shall be hard wired to the pump controls to shutdown all pumps.
- J. The electric control panel shall be capable of handling the 2 proposed pumps, along with all mechanical and electrical equipment of the package. The panel shall provide for all auxiliary equipment and for Healy-Ruff two way radio telemetry/RTU panel equipment and connections.



K. Remote Telemetry:

1. Radio telemetry shall be used with the pump station. The Contractor is responsible for providing the appropriate equipment to tie into the Owners existing Supervisory Control and Data Acquisition (SCADA) system. This includes, and is not limited to all radios, antennas, cables, conduit, antenna by masts and lighting protection.
2. The telemetry equipment supplier shall provide radio path surveys. All paths shall be designed for at least 99.9% reliability. The telemetry supplier shall provide all necessary forms completely filled out to the end user for radio frequency coordination and FCC licensing. The only action required on the part of the end user shall be to sign the forms. The telemetry system supplier shall pay all licensing fees.
3. Where a repeater station is required, the equipment supplier shall coordinate with the Owner for all possible locations.

2.9 **WIRING**

- A. The pump station shall be completely wired at the factory except for the power feeder lines in accordance with NEC standards. All wiring in the pump station shall be color coded and indicated on the wiring diagram that is part of the shop drawings.
- B. All wiring outside the control panel shall be in conduit except for 110V accessory items, which the manufacturer will provide with insulated cable.
- C. All wiring for float switches and level equipment shall be provided. Manufacturer shall coordinate with Contractor for all termination/wiring requirements on Contractors part.
- D. All wiring coordination shall be prior to bid. All wiring and terminations required for a complete operational system shall be provided.

2.10 **TERMINAL TEST STRIP AND TEST LIGHT**

- A. A terminal test strip and 120V neon test light shall be provided within the control panel for the operator's use in determining a malfunction in the various control components. All test points shall be wired to the terminal test strip. A step by step troubleshooting guide shall be furnished to assist the operator in testing each component. This test system shall have the capability of testing at least the following components: control circuit breaker, H-O-A switches, alternator, float switches, electrode relays, capacitors, resistors, and diodes.

## **2.11 PROTECTION AGAINST CORROSION**

- A. After welding, all inside and outside surfaces of the assembly shall be blasted with steel grit to remove rust, mill scale, weld slag, etc. All weld spatter and surface roughness shall be removed by grinding. Immediately after cleaning and prior to shipment, a single heavy inert coating shall be factory applied to all inside and outside surfaces. The dry coating shall contain a minimum of 85 percent epoxy resin, with the rest being pigments and thixotropic agents.

## **2.12 FACTORY TEST**

- A. All components of the pump station shall be given an operational test at the factory to check for excessive vibration of all equipment, for leaks in all piping or seals, and for correct operation of the vacuum priming, control systems, and all auxiliary equipment. Pumps shall take suction from a deep well, simulating actual service conditions

# **PART 3 EXECUTION**

## **3.1 TECHNICAL DIRECTION**

- A. The manufacture of the packaged wastewater pumping system shall provide the services of a trained, qualified technician for three (3) eight-hour days, one (1) trip, for the purpose of inspecting the installation to ensure compliance with the shop drawings, checkout, initial start-up, certification, and instruction of the plant operating personnel in the proper method of operation, adjusting and maintenance of the equipment.
- B. The Contractor shall assume all responsibility for the readiness of the equipment when requests start-up service. Should the manufacturer's technician arrive at the job-site and determine that the system cannot be started up within a reasonable time, the manufacturer shall have the option to bring the technician home and bill the Contractor for time, travel, and living expenses. Said costs shall be paid by the Contractor with no additional costs carried over to the Owner.
- C. A written report shall be submitted to the Engineer covering the technician's findings, installation approval, and all inspections. The written report shall also detail any deficiencies noted. The technician shall notify the Contractor and Engineer of anything in the installation which might render any portion of the manufacturer's warranty null and void.

## **3.2 SPARE PARTS**

- A. A complete replacement pump shaft seal assembly shall be furnished with each packaged wastewater pumping system. The spare seal shall be packed in a suitable container and shall include complete installation instructions. A spare volute and seal gasket shall also be provided.

END OF SECTION

CHAPTER 4  
CONCRETE FOR UTILITY LINES

PART 1 GENERAL

- 1.1 This item shall include furnishing and installing concrete blocking, cradles, anchors, caps, pipe protection, and/or encasement at the locations shown on the drawings and/or as directed by the A/E.
- 1.2 Concrete work shall conform to ACI 301-72 (as revised), as modified by the supplemental requirements below:

PART 2 PRODUCTS

2.1 **STRENGTH**

The strength of concrete shall be 4,000 psi unless otherwise shown on the drawings.

2.2 **DURABILITY**

All concrete exposed to weather shall be air entrained.

2.3 **SLUMP**

Concrete shall be proportional and produced to have a slump of 3 inches with a 1 inch tolerance.

2.4 **ADMIXTURES**

Air entrainment, mandatory for concrete exposed to weather, may be used. A water reducing admixture (retarding, normal, or accelerating, depending on placing temperature), may be used if approved by the City of Franklin.

2.5 **REINFORCING STEEL**

Yield strength of reinforcing steel shall be 60,000 psi.

END OF SECTION

## CHAPTER 4

### SEEDING

#### PART 1 GENERAL INFORMATION

- 1.1 This work shall be performed in all disturbed areas not receiving such site improvements as buildings, roads, walks, sod, planting, etc., and shall include, but not necessarily be limited to, all seed bed preparation; the supplying and placing of soil additives, seed, and mulch wherever required by the drawings or directed by the Design Engineer.
- 1.2 Unless otherwise approved in writing by the City of Franklin, seeding operations shall be limited to the following planting periods:
  - 1.2.1 Spring - March 1 through May 30
  - 1.2.2 Fall - August 15 through October 31
- 1.3 Refer to other sections for items affecting seeding. Coordinate this work with that specified by other sections for timely execution.

#### PART 2 PRODUCTS

##### 2.1 **GRASS SEED**

- 2.1.1 Kentucky 31 Fescue (*Festuca Elatior*) and annual rye meeting the requirements of the State Department of Agriculture and furnished in new bags or bags that are sound and not mended; no "below standard" seed accepted. Where lawns or fields have special grass, replace in kind.

##### 2.2 **FERTILIZER**

- 2.2.1 Commercially manufactured; Grade 10-10-10; furnished in standard containers that are clearly marked with the name, weight, and guaranteed analysis of the contents and that ensure proper protection in transportation and handling; and in compliance with all local, state, and federal fertilizer laws.

##### 2.3 **AGRICULTURAL LIMESTONE**

- 2.3.1 Containing a minimum of 85 percent calcium carbonate and magnesium carbonate combined, 85 percent of which passes a No. 10 mesh sieve.

##### 2.4 **MULCH**

- 2.4.1 Stalks of rye, oats, wheat, or other approved grain crops properly cured prior to baling, air dried, and reasonably free of noxious weeds and weed seeds or other material detrimental to plant growth.

### PART 3 EXECUTION

- 3.1 Perform all seeding and related work as a continuous operation. Sow seed as soon as the seed bed has been prepared, and perform subsequent work in a continuous manner.
- 3.2 Before beginning seeding operations in any area, complete the placing of topsoil and final grading, and have the work approved by the Design Engineer.
- 3.3 Scarify, disk, harrow, rake, or otherwise work each area to be seeded until the soil has been loosened and pulverized to a depth of not less than 2 inches. Perform this work only when the soil is in a tillable and workable condition.
- 3.4 Apply fertilizer and agricultural limestone uniformly over the seed bed, and lightly harrow, rake, or otherwise incorporate them into the soil for a depth of approximately 1 inch at the following rates:
  - 3.4.1 Fertilizer: 40 pounds per 1,000 square feet
  - 3.4.2 Agricultural Limestone: 80 pounds per 1,000 square feet
- 3.5 Sow seed uniformly with a rotary seeder, wheelbarrow seeder, or hydraulic equipment or by other satisfactory means.
  - 3.5.1 Hydroseed with hydraulic equipment
- 3.6 The seeding rate shall be 5 pounds per 1,000 square feet for Kentucky 31 Fescue (*Festuca Elatior*).
- 3.7 Hydroseed with a wood fiber mulch mixed in a slurry
  - 3.7.1 Mulch Rate: 100 pounds minimum per 1,000 square feet
- 3.8 When seeding during March 1 through April 1 and October 1 through November 20, add an additional 3 pounds per 1,000 square feet of annual rye grass.
- 3.9 Perform no seeding during windy weather or when the ground surface is frozen, wet, or otherwise untillable.
- 3.10 When seeding with mulch is specified, spread the mulch material evenly over the seeded areas immediately following the seeding operation.

- 3.10.1 Mulch Rate: 2 bales (100 pound minimum) per 1,000 square feet
- 3.11 The mulch rate may be varied by the Design Engineer and/or the water department, depending on the texture and condition of the mulch material and the characteristics of the area seeded. Cover all portions of the seeded areas with a uniform layer of mulch so that approximately 25 percent of the ground is visible.
- 3.12 No equipment, material storage, construction traffic, etc., will be permitted on newly seeded ground.
- 3.13 Dispose of all surplus materials as directed by the Owner.

#### PART 4 INSPECTIONS

- 4.1 The City of Franklin shall inspect the seeding within 60 days after planting and determine if it is acceptable.

#### PART 5 GUARANTEE

- 5.1 Secure an acceptable growth of grass in all areas designated for seeding, and maintain these areas for one full growing season.
- 5.2 An area is considered acceptable if it is represented by a minimum of 100 seedlings per square foot of the permanent species of grass representative of the seed mixture. If an acceptable growth is not obtained on the first planting, reseeding and remulching will be required.
- 5.3 If the planting is determined by the City of Franklin to be unsuccessful, rework the ground, refertilize, reseed, and remulch.

END OF SECTION

## CHAPTER 4

### SODDING

#### PART 1 GENERAL INFORMATION

- 1.1 This work shall include all soil preparation and the storage, transportation, placing, and maintenance of sod at all locations shown on the drawings or as directed by the Design Engineer.
- 1.2 Temporary storage of sod is permitted; however, take care to maintain the sod in a live, growing condition. Sod shall be rejected if it is permitted to decay or dry out to the extent that, in the judgment of the Design Engineer, its survival is doubtful. Dispose of rejected sod at no expense to the City.
- 1.3 Set sod between October 1 and April 1 when the soil is in a workable condition.
- 1.4 Do not set sod out of season unless soil conditions are favorable and written permission is obtained from the water department.
- 1.5 Refer to other sections for items affecting sodding. Coordinate this work with that specified by other sections for timely execution. The Contractor shall be wholly responsible for the scheduling, ordering, receiving, storing, and installing of all sodding materials.

#### PART 2 PRODUCTS

##### 2.1 **SOD**

- 2.1.1 Kentucky 31 Fescue (*Festuca Elatior*); new sod consisting of live, dense, well rooted growth; well suited for the intended purpose and soil conditions; completely free of noxious weeds and grasses (Bermuda grass, quack grass, Johnson grass, Canada thistle); and containing less than 5 plants of objectionable weeds per 100 square feet if nursery grown or 10 such plants if field grown.

##### 2.2 **FERTILIZER**

- 2.2.1 Commercially manufactured, Grade 10-10-10; furnished in standard containers that are clearly marked with the name, weight, and guaranteed analysis of the contents and that ensure proper protection in transportation and handling; and in compliance with all local, state, and federal fertilizer laws.

## 2.3 **AGRICULTURAL LIMESTONE**

- 2.3.1 Containing a minimum of 85 percent calcium carbonate and magnesium carbonate combined, 85 percent of which passes a No. 10 mesh sieve.

## PART 3 EXECUTION

- 3.1 Before beginning sodding operations in any area, complete the placing of topsoil and final grading, and have the work approved by the water department.
- 3.2 Scarify each area to be sodded a minimum of 2 inches.
- 3.3 Apply fertilizer and agricultural limestone uniformly over the sod bed at the rates shown below. Immediately prior to placing sod, water the sod bed until it is saturated to a depth of 1 inch, and keep it moist until the sod is placed.
  - 3.3.1 Fertilizer: 40 pounds per 1,000 square feet of 10-10-10
  - 3.3.2 Agricultural Limestone: 80 pounds per 1,000 square feet
- 3.4 Place sod as soon as practical after its removal from point of origin. Keep it moist while displaced.
- 3.5 Place sod by hand so that the edges are in close contact and in a position to break joints with the long dimension perpendicular to the slope. Fit and pound the sod into place with a 10 inch x 10 inch wood tamp or other similar implements.
- 3.6 Immediately after placing the sod, thoroughly wet and roll it.
- 3.7 Two weeks after the sod is installed, top dress and thoroughly water it. Top dressing shall consist of the following:
  - 3.7.1 1/2 to 1 pound: 38 percent urea formaldehyde per 1,000 square feet
  - 3.7.2 20 pounds: 6-12-12 per 1,000 square feet
- 3.8 No equipment, material storage, construction traffic, etc., will be permitted on newly sodded areas.
- 3.9 Dispose of all surplus material at no additional expense to the City of Franklin.

## PART 4 INSPECTIONS



- 4.1 The water department shall inspect the sod within 30 days after installation and determine if it is acceptable.

#### PART 5 GUARANTEES

- 5.1 Establish an acceptable growth of the specified sod on all areas indicated on the drawings or as directed by the Design Engineer and/or the water department. An area is considered acceptable if the majority of each piece of sod is alive and healthy and generally free from weeds, insects, and disease.

END OF SECTION

## CHAPTER 4

### PAVEMENT REPAIR

#### PART 1 GENERAL INFORMATION

- 1.1 The work specified by this section shall consist of repairing or replacing all damaged pavement, whether public or private. Dirt shoulders, roads, streets, drives, and walks are to be restored to their original condition as an incidental part of the installation of utilities. Repair damaged base on either side of a trench wherever necessary. Trim the oxidation surface to neat lines outside of the trench wall, and repave the entire area as specified below and as shown on the drawings or on the standard drawings.
- 1.2 The specifications make reference to the current edition of the standard specifications of the Tennessee Department of Transportation (TDOT). Even though the weather limitations, construction methods, and materials specifications contained in the TDOT specifications may not be explicitly repeated in these specifications, they shall, wherever applicable to the work called for by this section, be considered as implied and therefore adhered to. However, the various subsections "Basis for Payment" contained in the TDOT specifications shall not be considered applicable.
- 1.3 The repair of trenches in streets and roads, including shoulders, under the jurisdiction of the City of Franklin shall be made in accordance with and under the direction of the Street Department. County owned roads in Williamson County shall be repaired in accordance with the Williamson County Highway Department regulations. State owned roads shall be repaired in accordance with the Tennessee Department of Transportation.
- 1.3.1 Refer to other sections for work related to that covered by this section.

#### PART 2 PRODUCTS

##### 2.1 **MINERAL AGGREGATE BASE**

- 2.1.1 Class A, Grading D crushed stone "Pugmill Mix" (Section 303, Subsection 903.05)

## **2.2 BITUMINOUS PRIME COATS**

- 2.2.1 Cutback asphalt, Grade RC-250, or emulsified asphalt, Grade AE-P (Section 402, Subsections 904.02 and 904.03)

## **2.3 CRUSHED STONE CHIPS**

- 2.3.1 Size 6 or Size 7 (Subsection 903.14)

## **2.4 DOUBLE BITUMINOUS SURFACE**

- 2.4.1 For both courses, either cutback asphalt, Grade RC-800 or RC-3000, or emulsified asphalt, Grade RS-2 (Subsections 904.02 and 904.03)

## **2.5 ASPHALTIC CONCRETE BINDER**

- 2.5.1 Grading B or C, as directed by the City of Franklin or the Field Representative (Section 307)

## **2.6 BITUMINOUS TACK COAT**

- 2.6.1 Grade AE-3 (Section 403, Subsection 904.03)

## **2.7 ASPHALTIC CONCRETE SURFACE**

- 2.7.1 Grading E (Section 411)

## **2.8 QUICK DRY TRAFFIC MARKING PAINT (WHITE AND YELLOW)**

- 2.8.1 Subsection 910.05.

## **PART 3 EXECUTION**

### **3.1 SUBGRADE**

- 3.1.1 Before any base material is installed, compact the subgrade of the area to be paved to 95 percent of optimum density as determined by ASTM D698 (Standard Proctor).
- 3.1.2 The backfill material shall contain no topsoil or organic matter. For all areas where subgrade has been prepared, test for uniformity of support by driving a loaded dump truck at a speed of 2 to 3 mph over the entire surface. Make further improvements on all areas that show a deflection of 1-inch or more. When completed, the finished subgrade shall be hard, smooth, stable, and constructed in reasonably close conformance with the lines and grades that existed prior to beginning construction.

- 3.1.3 When a base course is compacted, cut back the surface course of the existing pavement a minimum of 1-foot beyond the limit of the joint between the old and new base course or as shown on the standard drawings. Take special care to ensure good compaction of the new base course at the joint. Apply and compact the surface to conform to the existing pavement so that it will have no surface irregularity.

## 3.2 **BASE**

- 3.2.1 Install a mineral aggregate base of the type specified above in accordance with Section 303 of the TDOT specifications. The maximum compacted thickness of any one layer shall be 6 inches, and the total thickness of the base shall be that indicated by the standard drawings or as shown on the plans.

## 3.3 **SEAL COAT SURFACE**

- 3.3.1 Uniformly apply a bituminous prime coat of either emulsified asphalt, Grade AE-P, or cutback asphalt, Grade RC-250, over the entire width of the area to be surfaced at a rate of 0.3 gallon per square yard. Immediately after application, uniformly cover the entire area with Size 7 crushed stone chips at a rate of 12 pounds per square yard.

## 3.4 **DOUBLE BITUMINOUS SURFACE**

- 3.4.1 Apply the first course at a rate of 0.38 to 0.42 gallon per square yard with either emulsified asphalt, Grade RS-2, or cutback asphalt, Grade RC-800 or RC-3000, and then immediately cover with Size 6 crushed stone chips at a rate of 33 to 37 pounds per square yard. After this is rolled, apply the second course at a rate of 0.30 to 0.35 gallon per square yard, and at once uniformly cover with Size 7 chips at a rate of 20 to 25 pounds per square yard. Then roll the entire area.
- 3.4.2 After the application of the cover aggregate, lightly broom or otherwise maintain the surface for a period of 4 days, or as directed by the City of Franklin. Maintenance of the surface shall include the distribution of cover aggregate over the surface to absorb any free bitumen and cover any areas deficient in aggregate. Sweep excess material from the entire surface with rotary brooms. Sweep the surface at the time determined by the water department.

## 3.5 **ASPHALTIC CONCRETE BINDER**

- 3.5.1 Apply a bituminous prime coat of emulsified asphalt, Grade AE-P, or cutback asphalt, Grade RC-250, at a rate of 0.38 to 0.42 gallon per square yard. Take care to prevent the bituminous material's splashing on exposed faces of curbs

and gutters, walls, walks, trees, etc.; if such splashing does occur, remove it immediately. After the prime coat has been properly cured, apply an asphaltic concrete binder to the thickness shown on the standard drawings or the plans.

- 3.5.2 Carefully place the material to avoid segregation of the mix. Broadcasting of the material will not be permitted. Remove any lumps that do not readily break down.

### 3.6 **ASPHALTIC CONCRETE SURFACE**

- 3.6.1 If the asphaltic concrete surface course is to be placed directly on the mineral aggregate base, place a bituminous prime coat as described above. If, however, the surface course is to be placed on a binder course, then apply a bituminous tack coat of the sort specified above under PRODUCTS at a rate of 0.05 to 0.10 gallon per square yard. Take care to prevent the bituminous material's splashing on exposed faces of curbs, gutters, walls, walks, trees, etc.; if such splashing does occur, remove it immediately. After the prime or tack coat has been properly cured, apply the asphaltic concrete to the thickness shown on the drawings or standard drawings. Apply the surface course as described above for the binder course.

### 3.7 **SMOOTHNESS**

- 3.7.1 The finished surfaces shall conform to the lines and grades that existed prior to construction. No deviations, variations, or irregularities exceeding 1/4-inch in any direction when tested with a 12-foot straightedge will be permitted in the finished work, nor will any depressions that will not drain. Correct all such defects.

### 3.8 **SAMPLING AND TESTING**

- 3.8.1 Submit to the Design Engineer or the water department test reports made by an independent testing laboratory on the crushed stone aggregate, bituminous materials, and asphaltic concrete design mixes, and obtain his approval of these reports before starting paving operations.
- 3.8.2 Tests shall be made on the completed elements of the pavement to ascertain the compacted thickness of the base and surface courses. If sections with deficient thicknesses are found, the full section for a reasonable distance on each side of the deficiency shall be refused. Remove and reinstall all such sections. Patch all test holes in connection with thickness tests.
- 3.8.3 When making surface tests, furnish one man to mark all surface defects for corrections.

END OF SECTION

**TABLE OF CONTENTS**

**CHAPTER 5**

**STANDARD DRAWINGS**

| <u>NO.</u> | <u>DESCRIPTION</u> |
|------------|--------------------|
|------------|--------------------|

**WATER**

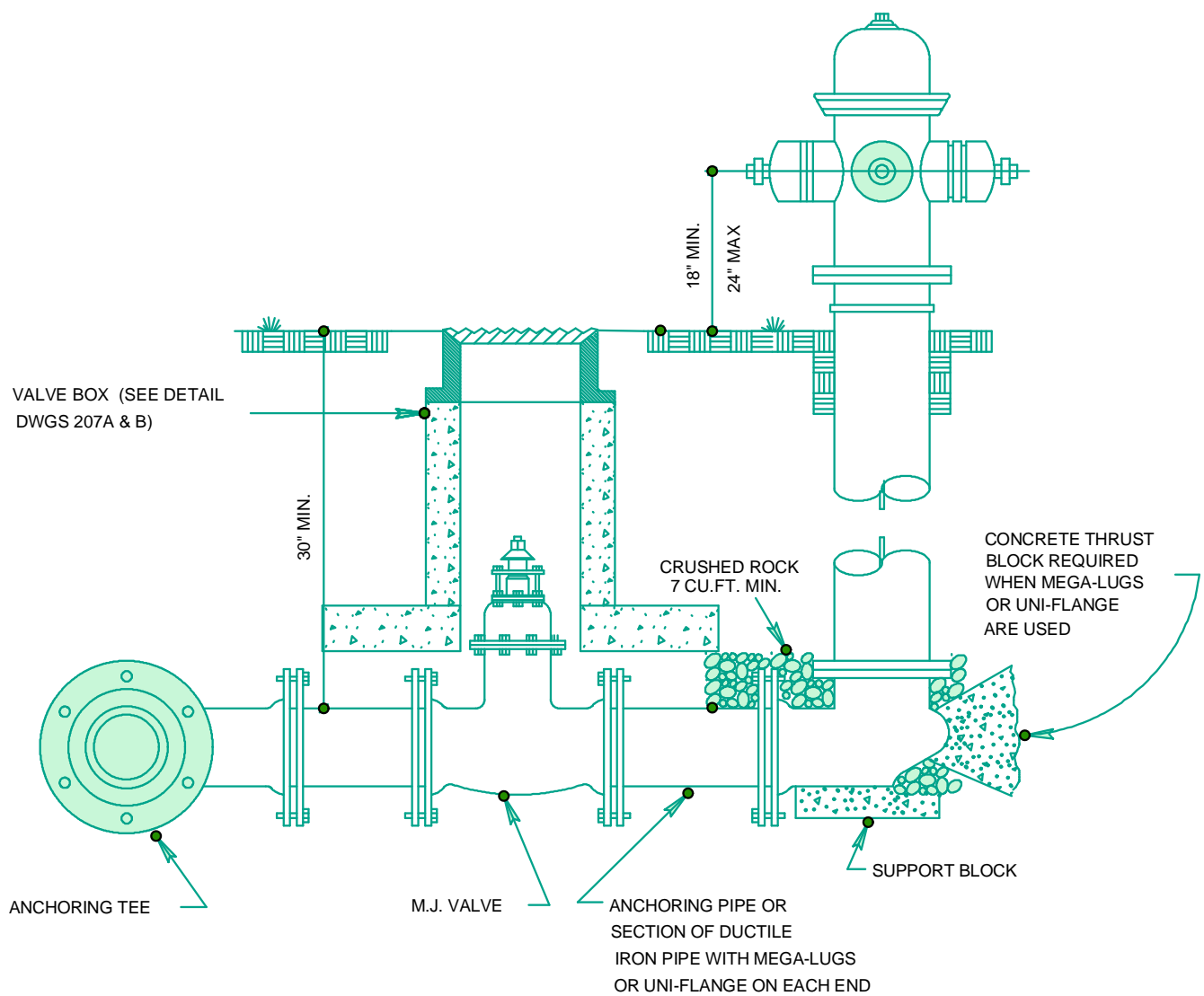
|      |  |
|------|--|
| W-1  | Typical Fire Hydrant Setting               |
| W-2  | 2" Blow-Off Hydrant Detail                 |
| W-3  | 3/4" Service Assembly                      |
| W-4  | Concrete Cap                               |
| W-5  | Concrete Thrust Blocking                   |
| W-6  | Concrete Thrust Blocking - Dimensions      |
| W-7  | 2" Service Assembly                        |
| W-8  | 3" Master Meter                            |
| W-9  | 4" to 8" Master Meter Assembly (Turbo)     |
| W-10 | 4" to 8" Master Meter Assembly (Compound)  |
| W-11 | Double Check Valve Assembly                |
| W-12 | Reduced Pressure Backflow Preventer        |
| W-13 | Automatic Air Release Valve Manhole Detail |

**WASTEWATER**

|      |   |
|------|---|
| S-1  | Standard Precast Concrete Manholes                      |
| S-2  | Detail of Plastic Gasket for Precast Manhole Sections   |
| S-3  | Detail of Standard Ladder Bars Manholes and Wetwells    |
| S-4  | Frame and Cover   |
| S-5  | Standard Drop Manhole                                   |
| S-6  | Concrete Cradle   |
| S-7  | Concrete Protection                                     |
| S-8  | Concrete Cap  |
| S-9  | Wastewater Laterals                                     |
| S-10 | Air Release Valve Sanitary Force Main                   |
| S-11 | Standard Manhole Vent                                   |
| S-12 | Standard Connection of Force Main to Fiberglass Manhole |
| S-13 | Valve Box and Cleanout Arrangements                     |

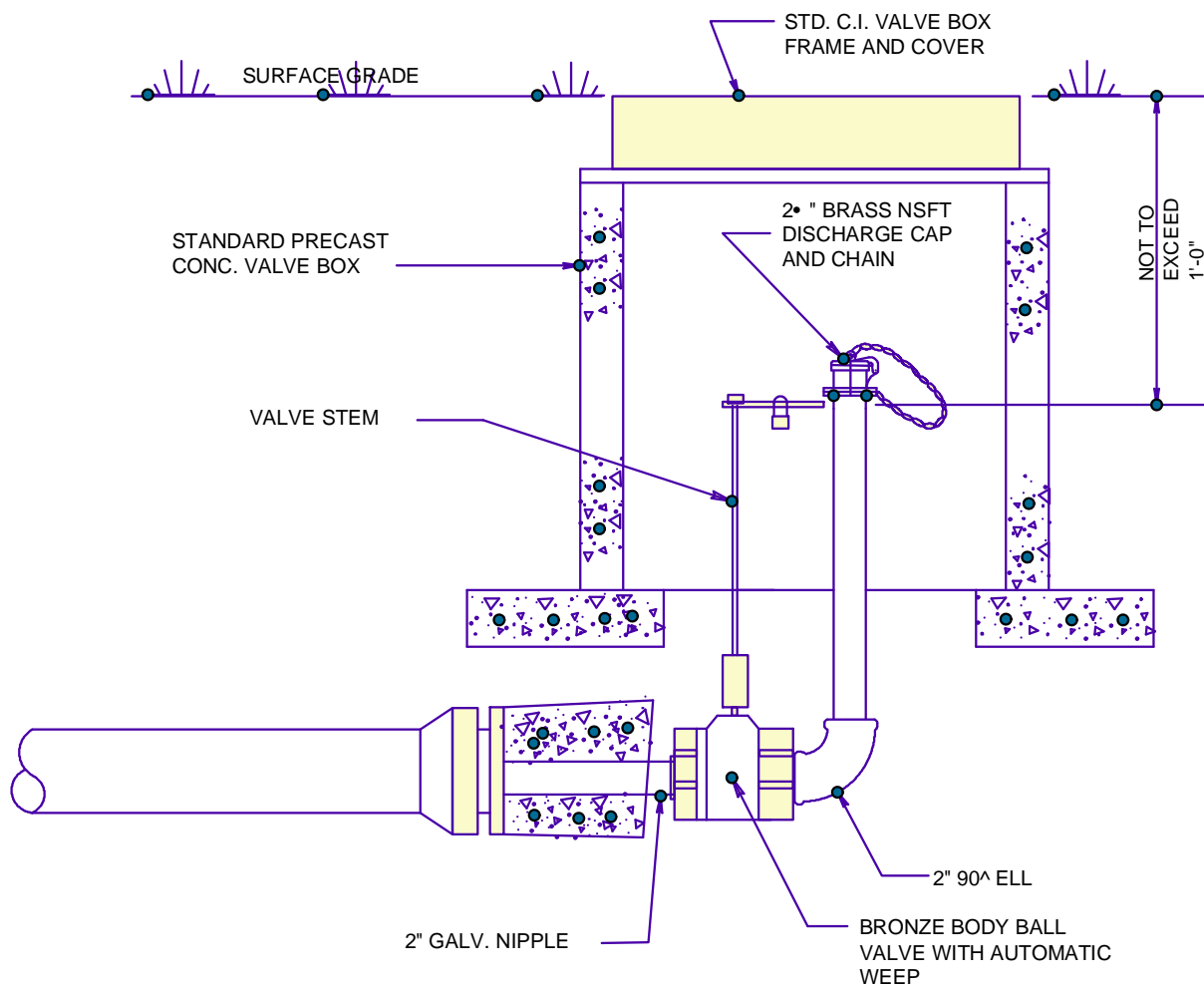
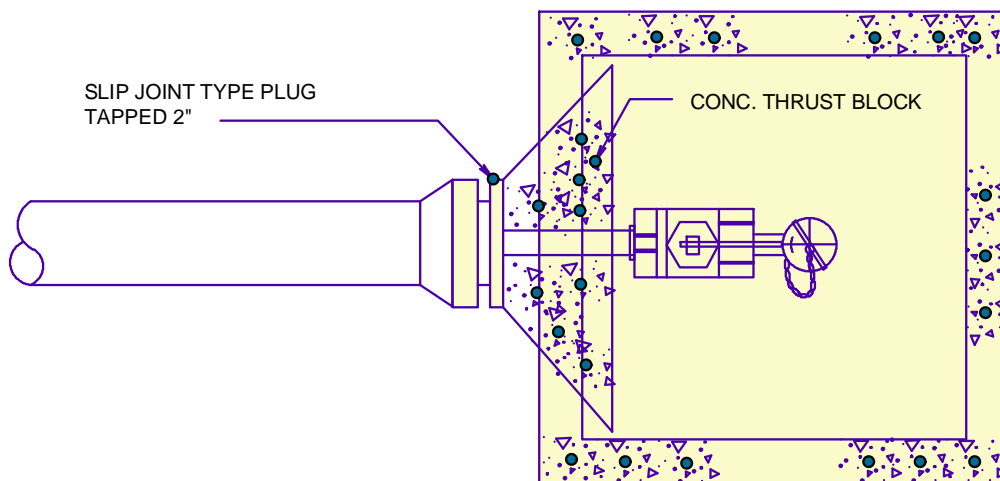
**GENERAL CONSTRUCTION**

|      |                             |
|------|-----------------------------|
| GC-1 | Typical Valve Box Setting   |
| GC-2 | Standard Concrete Valve Box |
| GC-3 | Fence Detail, Aluminum      |



## TYPICAL FIRE HYDRANT SETTING

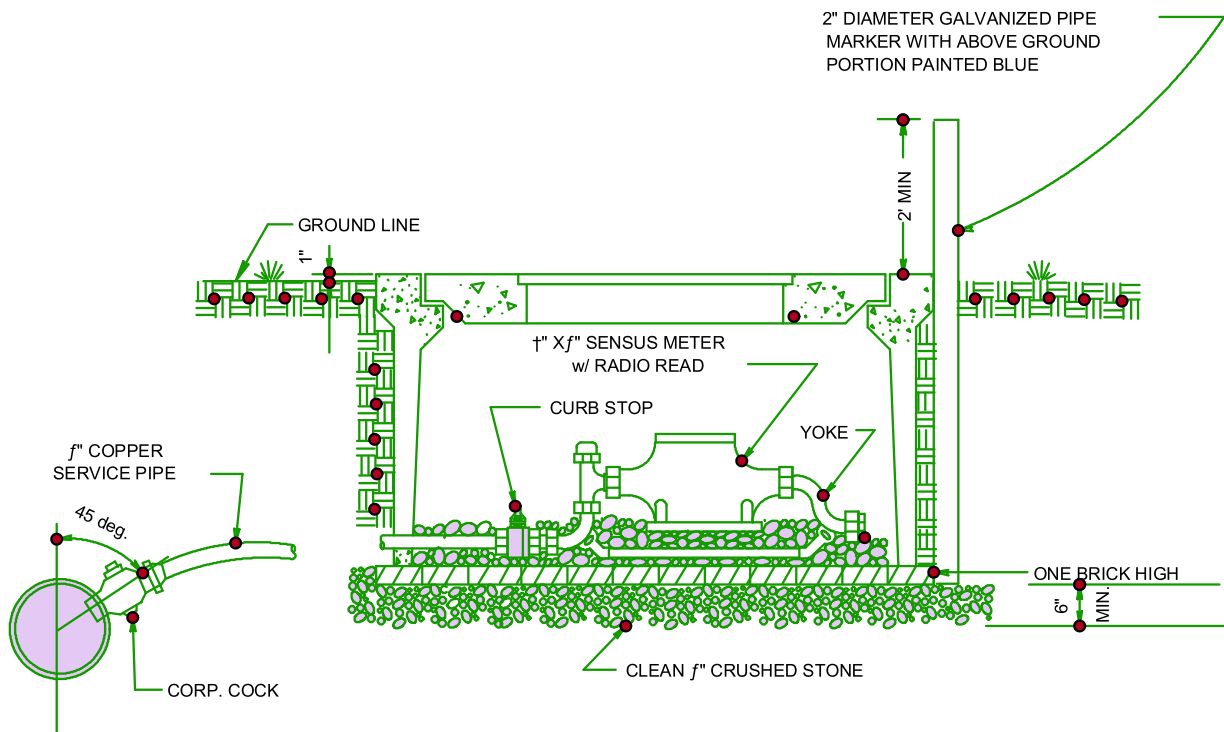
N.T.S.



## 2" BLOW-OFF DETAIL

NOTE: ALL FITTINGS AND PIPE SHALL BE BRASS OR COPPER  
AS APPROVED BY ENGINEER.

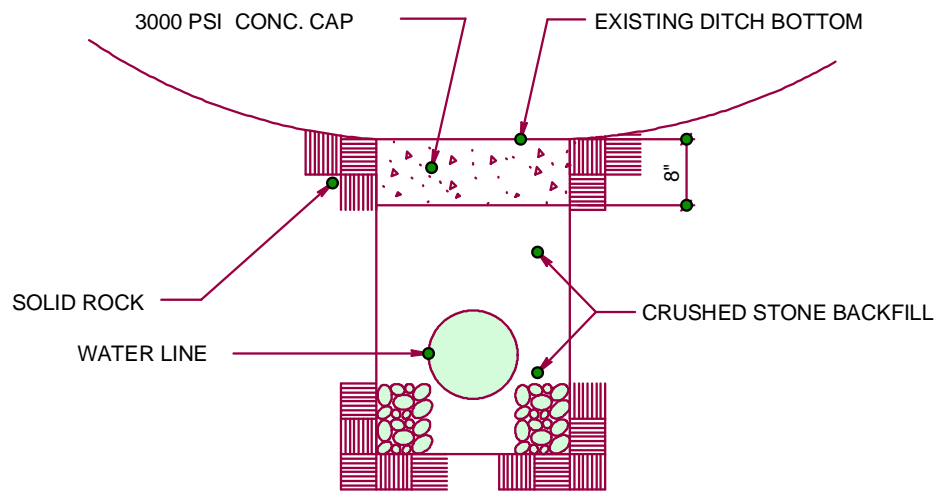




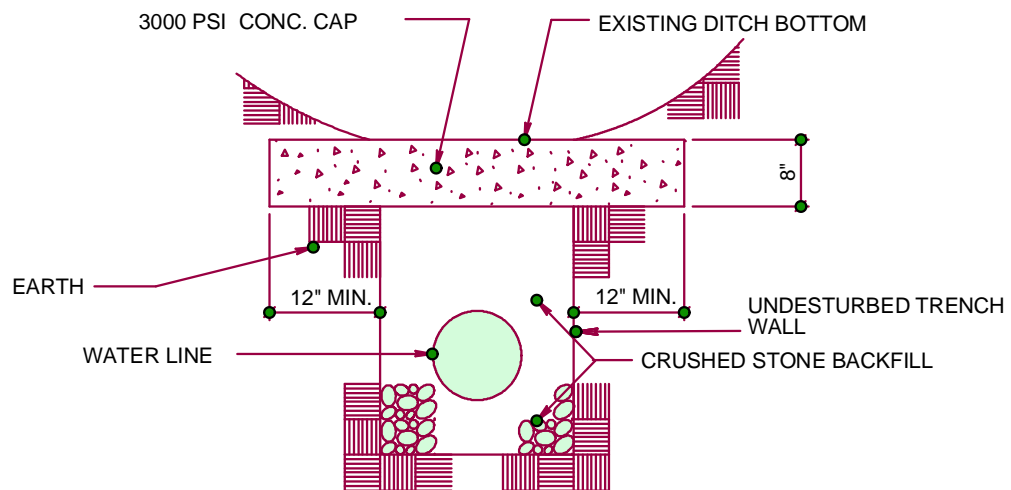
NOTE: PLACE 6" DEEP OF CLEAN  $\square$  TO f" CRUSHED STONE BELOW BOTTOM OF METER BOX.

### f" SERVICE ASSEMBLY

N.T.S.



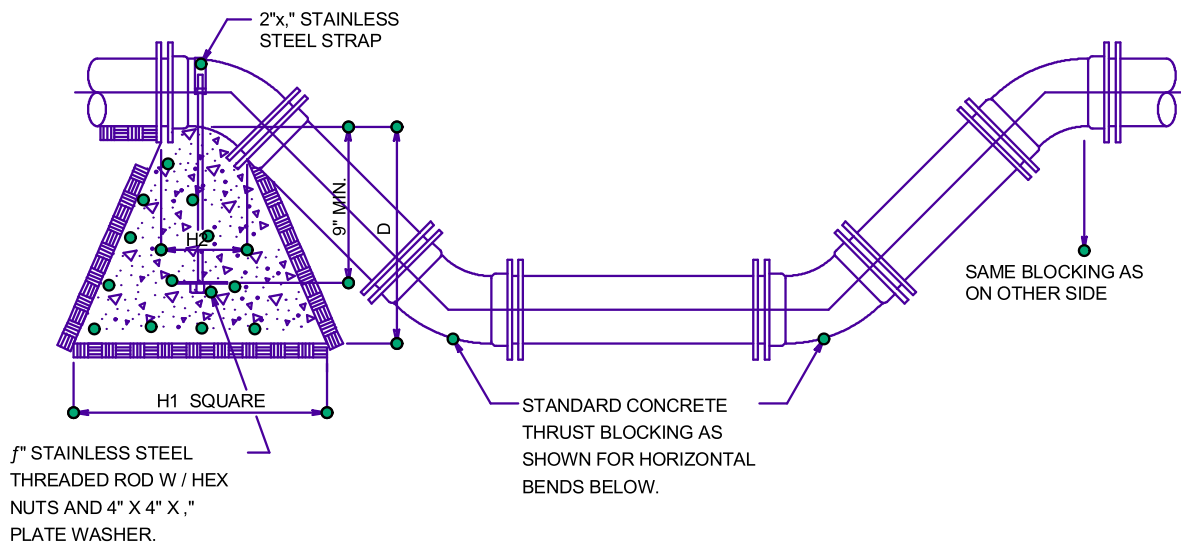
ROCK EXCAVATION



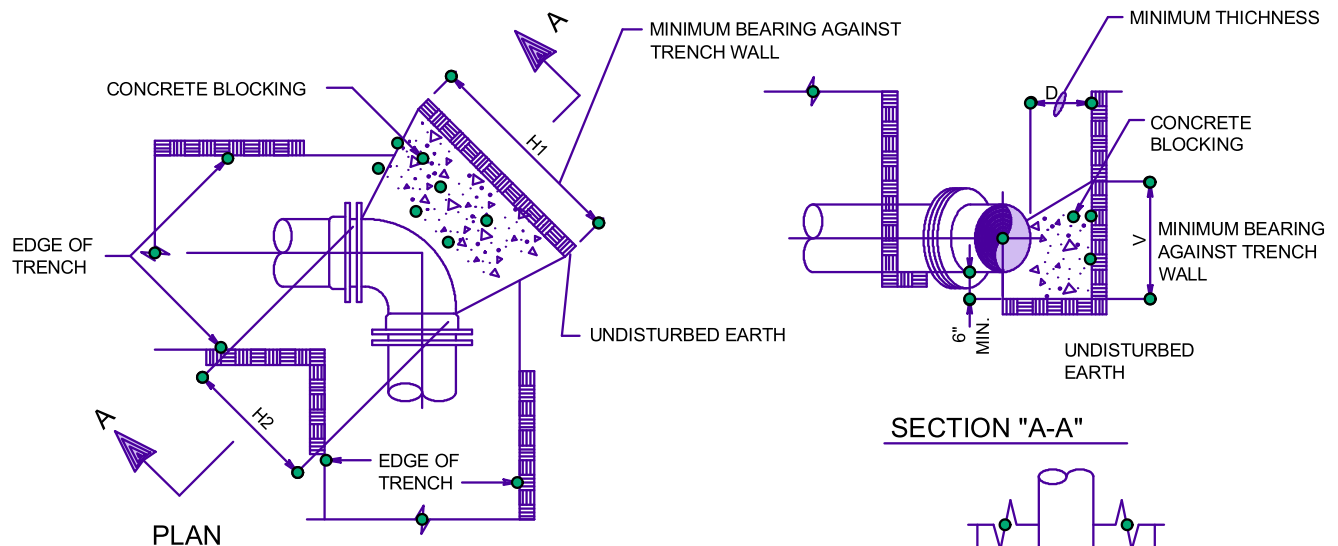
EARTH EXCAVATION

CONCRETE CAP

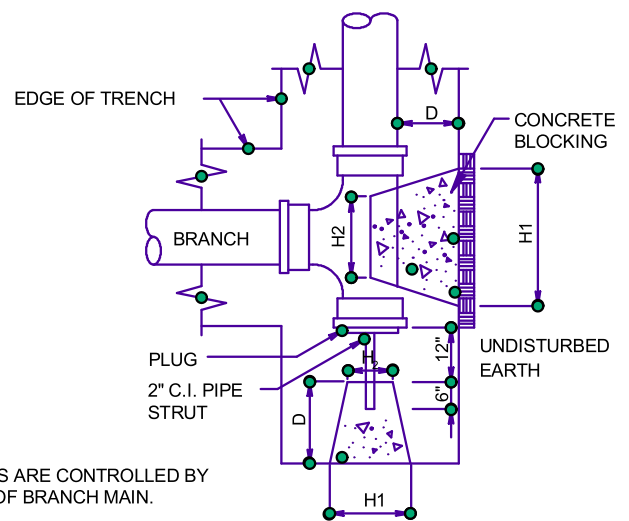
N.T.S.



### VERTICAL BENDS



### HORIZONTAL BENDS



NOTE:  
DIMENSIONS ARE CONTROLLED BY  
DIAMETER OF BRANCH MAIN.

### TEES, CROSSES & PLUGS

## CONCRETE THRUST BLOCKING

FOR DIMENSIONS SEE 221B

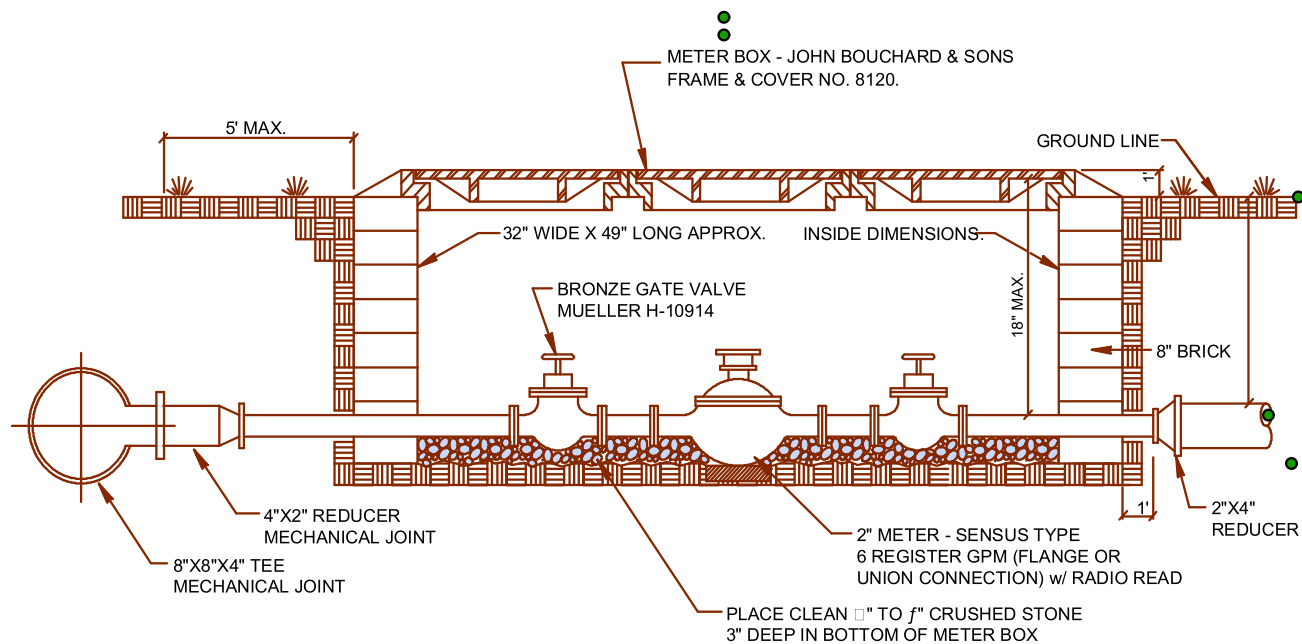
OCT. 2000

221-A

| TABLE OF DIMENSIONS FOR CONCRETE BLOCKING |                       |                |     |     |         |                |                |      |     |         |                |                |     |     |         |                |                |     |     |         |                |                |     |     |         |         |
|---|-----------------------|----------------|-----|-----|---------|----------------|----------------|------|-----|---------|----------------|----------------|-----|-----|---------|----------------|----------------|-----|-----|---------|----------------|----------------|-----|-----|---------|---------|
| SIZE                                      | TEES, PLUGS & CROSSES |                |     |     |         | 90° BENDS      |                |      |     |         | 45° BENDS      |                |     |     |         | 22 1/2° BENDS  |                |     |     |         | 1 1/4° BENDS   |                |     |     |         | SIZE    |
| PIPE                                      | H <sub>1</sub>        | H <sub>2</sub> | V   | D   | CU. FT. | H <sub>1</sub> | H <sub>2</sub> | V    | D   | CU. FT. | H <sub>1</sub> | H <sub>2</sub> | V   | D   | CU. FT. | H <sub>1</sub> | H <sub>2</sub> | V   | D   | CU. FT. | H <sub>1</sub> | H <sub>2</sub> | V   | D   | CU. FT. | PIPE    |
| 2" & 2"                                   | 18"                   | 10"            | 12" | 18" | 1.9     | 18"            | 10"            | 12"  | 18" | 1.9     | 18"            | 6"             | 12" | 18" | 1.5     | 18"            | 6"             | 12" | 18" | 1.5     | 18"            | 6"             | 12" | 18" | 1.5     | 2" & 2" |
| 3" & 4"                                   | 24"                   | 12"            | 12" | 18" | 2.3     | 24"            | 12"            | 12"  | 18" | 2.3     | 18"            | 8"             | 12" | 18" | 1.6     | 18"            | 8"             | 12" | 18" | 1.6     | 18"            | 8"             | 12" | 18" | 1.6     | 3" & 4" |
| 6"  | 24"                   | 16"            | 18" | 18" | 3.5     | 30"            | 16"            | 18"  | 18" | 4.1     | 24"            | 10"            | 16" | 18" | 3.2     | 24"            | 10"            | 16" | 18" | 3.2     | 24"            | 10"            | 16" | 18" | 3.2     | 6"      |
| 8"  | 36"                   | 18"            | 18" | 18" | 5.1     | 39"            | 18"            | 24"  | 18" | 7.3     | 30"            | 1 1/4"         | 18" | 18" | 4.0     | 24"            | 1 1/4"         | 18" | 18" | 3.5     | 24"            | 1 1/4"         | 16" | 18" | 3.4     | 8"      |
| 10"                                       | 48"                   | 24"            | 18" | 24" | 7.2     | 54"            | 32"            | 24"  | 18" | 10.3    | 24"            | 18"            | 21" | 18" | 4.6     | 24"            | 18"            | 21" | 18" | 4.6     | 24"            | 18"            | 21" | 18" | 4.6     | 10"     |
| 12"                                       | 54"                   | 30"            | 24" | 24" | 13.4    | 54"            | 32"            | 36"  | 24" | 18.2    | 42"            | 18"            | 24" | 24" | 9.6     | 24"            | 18"            | 24" | 24" | 6.6     | 24"            | 18"            | 21" | 24" | 6.1     | 12"     |
| 14"                                       | 60"                   | 32"            | 30" | 24" | 17.9    | 60"            | 40"            | 42"  | 24" | 25.0    | 44"            | 24"            | 30" | 24" | 13.2    | 30"            | 24"            | 24" | 24" | 9.2     | 27"            | 21"            | 24" | 24" | 7.9     | 14"     |
| 16"                                       | 66"                   | 34"            | 36" | 24" | 22.5    | 69"            | 48"            | 48"  | 24" | 29.0    | 48"            | 30"            | 36" | 24" | 17.0    | 36"            | 30"            | 27" | 24" | 1 1/8   | 27"            | 24"            | 27" | 24" | 9.1     | 16"     |
| 18"                                       | 72"                   | 36"            | 40" | 24" | 30.0    | 72"            | 48"            | 60"  | 24" | 38.0    | 48"            | 30"            | 42" | 24" | 21.0    | 42"            | 30"            | 30" | 24" | 15.0    | 30"            | 30"            | 36" | 24" | 13.0    | 18"     |
| 20"                                       | 84"                   | 38"            | 42" | 24" | 36.0    | 84"            | 48"            | 66"  | 24" | 48.0    | 54"            | 40"            | 46" | 24" | 27.0    | 48"            | 36"            | 36" | 24" | 19.0    | 42"            | 40"            | 36" | 24" | 18.0    | 20"     |
| 24"                                       | 108"                  | 42"            | 48" | 24" | 45.0    | 108"           | 60"            | 72"  | 24" | 68.0    | 60"            | 48"            | 56" | 24" | 41.0    | 54"            | 42"            | 42" | 24" | 25.0    | 48"            | 42"            | 42" | 24" | 23.0    | 24"     |
| 30"                                       | 132"                  | 52"            | 60" | 24" | 70.0    | 132"           | 72"            | 92"  | 24" | 104.0   | 72"            | 48"            | 76" | 24" | 58.0    | 60"            | 48"            | 48" | 24" | 32.0    | 50"            | 48"            | 54" | 24" | 32.0    | 30"     |
| 36"                                       | 162"                  | 58"            | 72" | 24" | 100.0   | 162"           | 96"            | 108" | 24" | 150.0   | 84"            | 72"            | 84" | 24" | 85.0    | 66"            | 48"            | 60" | 24" | 50.0    | 52"            | 48"            | 60" | 24" | 40.0    | 36"     |
| 42"                                       | 166"                  | 60"            | 84" | 36" | 168.4   | 190"           | 66"            | 108" | 36" | 190.0   | 122"           | 60"            | 84" | 24" | 90.0    | 72"            | 48"            | 72" | 24" | 56.0    | 56"            | 48"            | 66" | 24" | 44.0    | 42"     |
| 48"                                       | 172"                  | 66"            | 96" | 36" | 200     | 220"           | 72"            | 120" | 36" | 230.0   | 136"           | 60"            | 90" | 24" | 98.0    | 78"            | 48"            | 84" | 24" | 66.0    | 60"            | 48"            | 72" | 24" | 50.0    | 48"     |

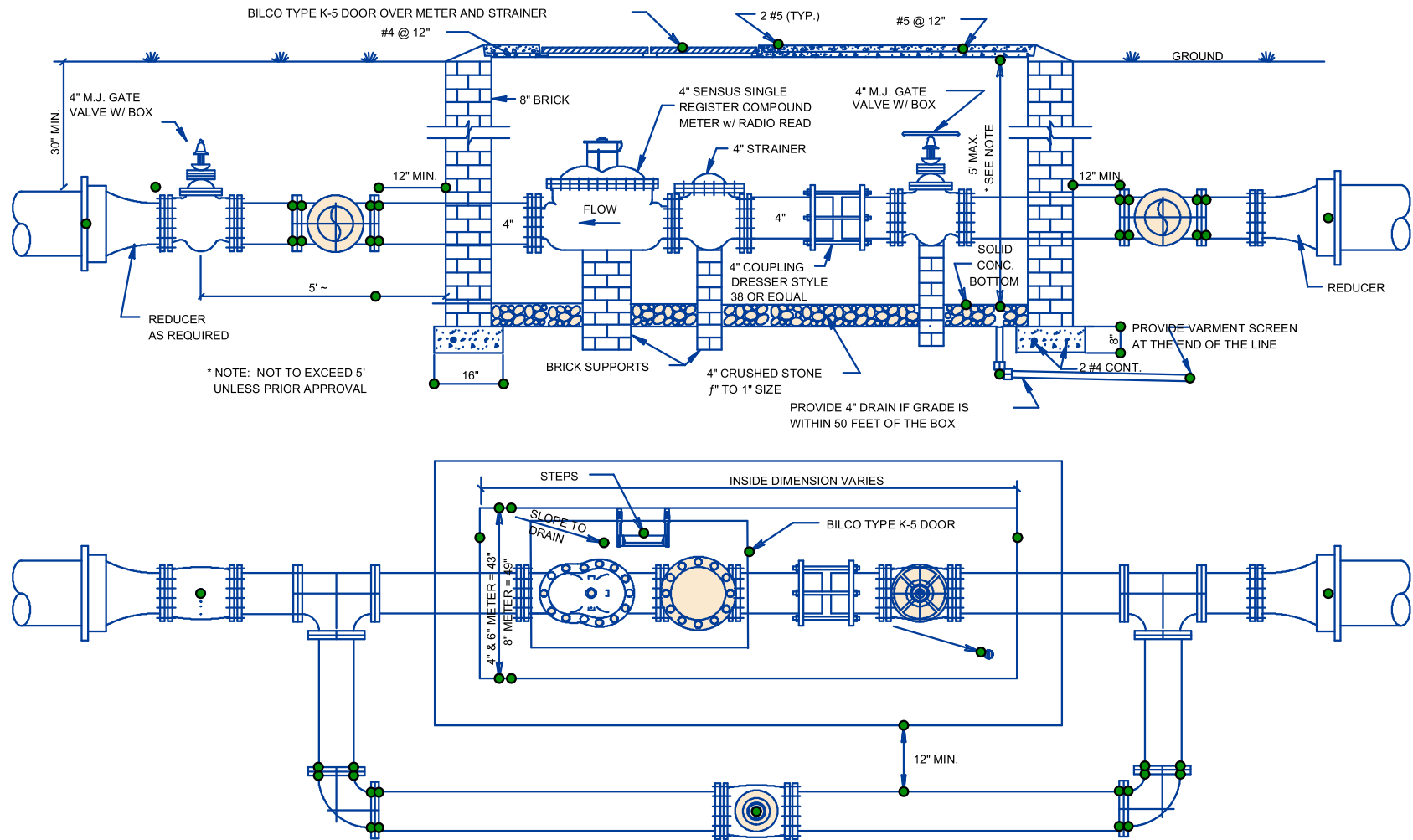
### CONCRETE THRUST BLOCKING

- THIS TABLE IS BASED ON AN INTERNAL HYDROSTATIC PRESSURE OF 200 PSI AND AN ALLOWABLE SOIL BEARING CAPACITY OF 4,000 LB/SF. THIS IS THE MINIMUM DIMENSIONS OF BLOCKING, EVEN THOUGH THE PRESSURE IS LESS THAN 200 PSI.
- SHOULD THE INTERNAL HYDROSTATIC PRESSURE EXCEED 200 PSI AND/OR THE ALLOWABLE SOIL BEARING CAPACITY BE LESS THAN 4,000 LB/SF, THE THRUST BLOCK SIZE MUST BE ENLARGED ACCORDINGLY. IF EITHER OR BOTH OF THESE CONDITIONS OCCUR, THE CONTRACTOR SHALL PROVIDE CALCULATIONS TO SUPPORT THE ENLARGED SIZE THRUST BLOCK PROPOSED.
- BLOCKING WILL BE PAID AT THE CONTRACT UNIT PRICE FOR 4,000 PSI CONCRETE FOR THE VOLUME SHOWN IN THE ABOVE TABLE OR AS APPROVED BY THE A/E FOR EACH FITTING SO BLOCKED, IF A SEPARATE ITEM APPEARS IN THE SCHEDULE OF A PROPOSAL FOR A UNIT PRICE CONTRACT. IF NO UNIT PRICE FOR CONCRETE BLOCKING APPEARS, NO SEPERATE PAYMENT WILL BE MADE FOR THRUST BLOCKING.
- ALL BENDS, TEES, CROSSES, AND PLUGS SHALL HAVE CONCRETE THRUST BLOCKING INSTALLED AS ON STANDARD DRAWINGS 221-A AND 221-B OR AS DIRECTED BY THE A/E.



## 2" SERVICE ASSEMBLY

N.T.S.

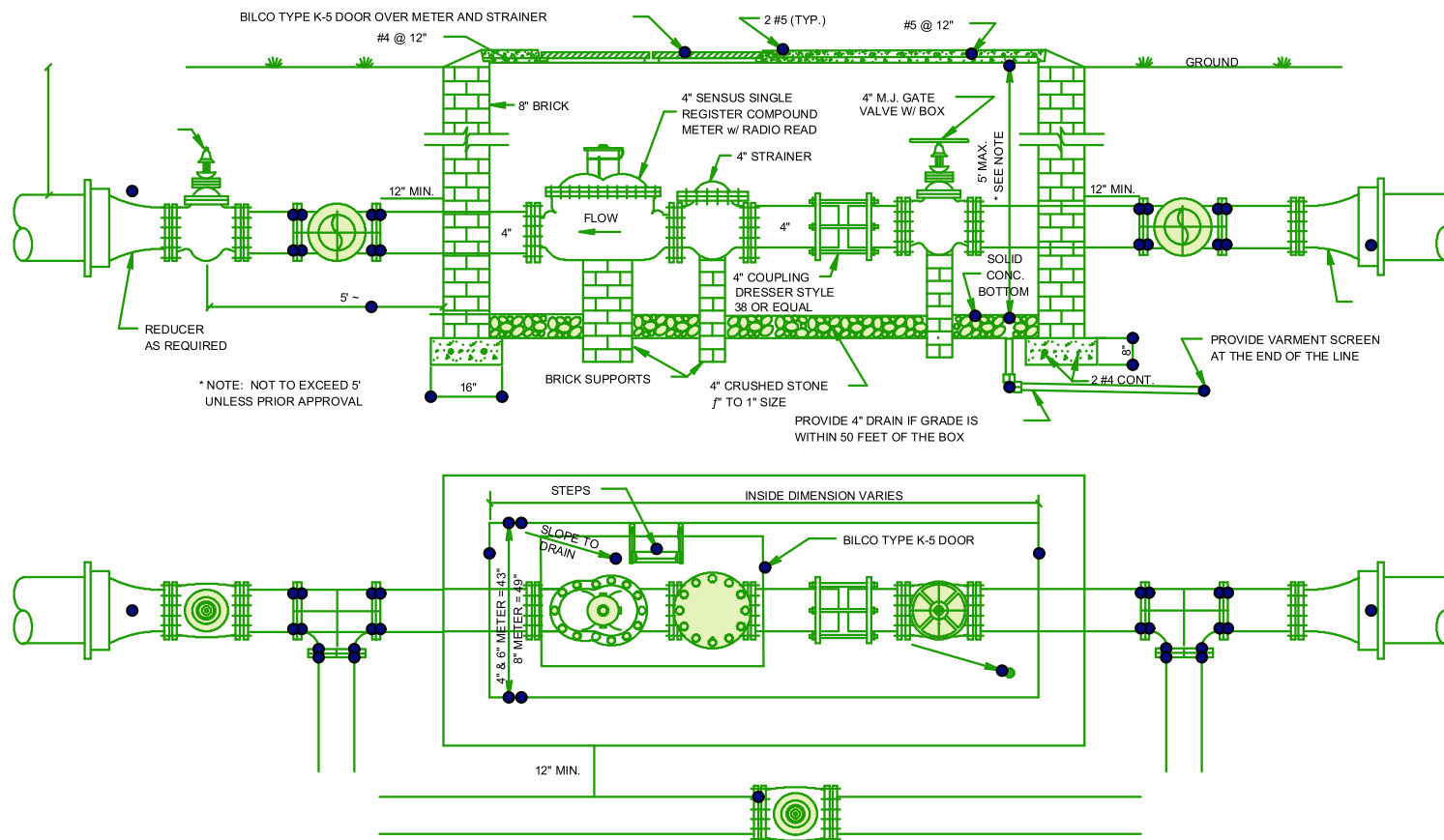


### 4" MASTER METER ASSEMBLY (TURBO)

N.T.S.

NOTE: BACKFLOW PREVENTION DEVICES ARE REQ'D. AND ARE TO MEET THE CITY'S REQUIREMENTS

OCT. 2000

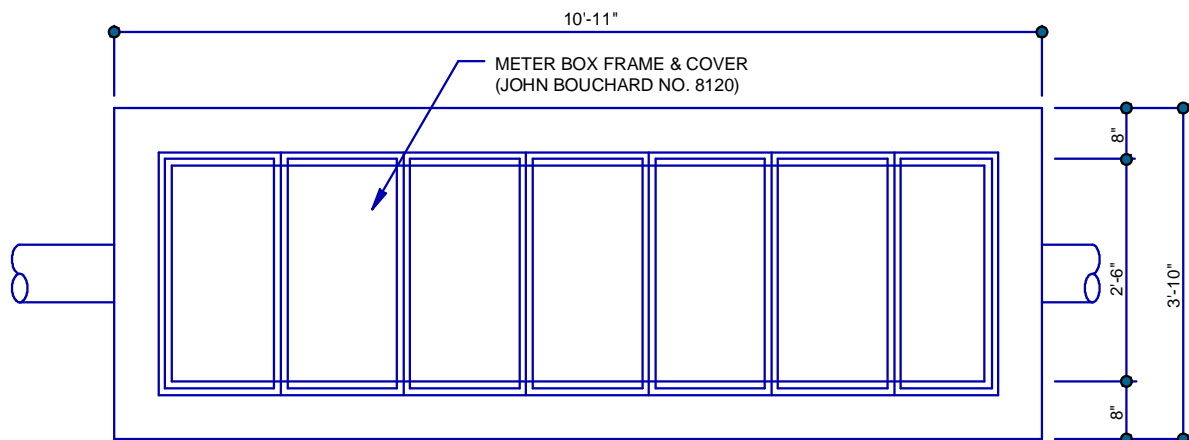


# 4" MASTER METER ASSEMBLY (COMPOUND (NOT FOR FIRE LINES))

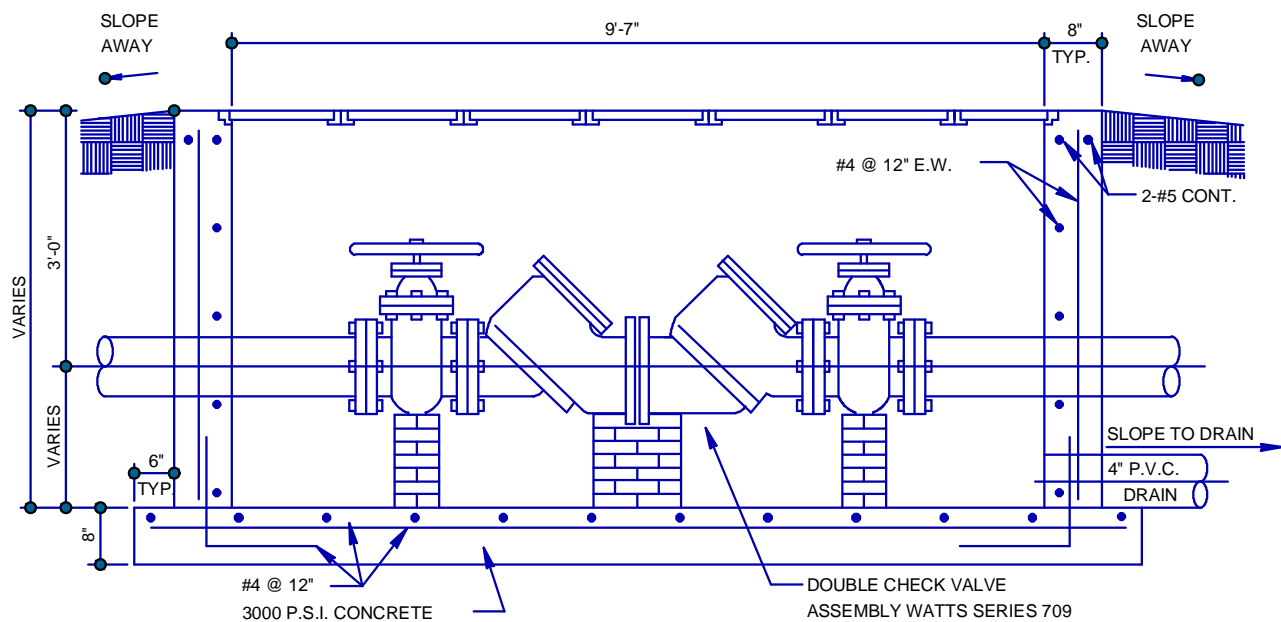
N.T.S.

NOTE: BACKFLOW PREVENTION  
DEVICES ARE REQ'D. AND ARE TO  
MEET THE CITY'S REQUIREMENTS

252B



PLAN VIEW OF VAULT

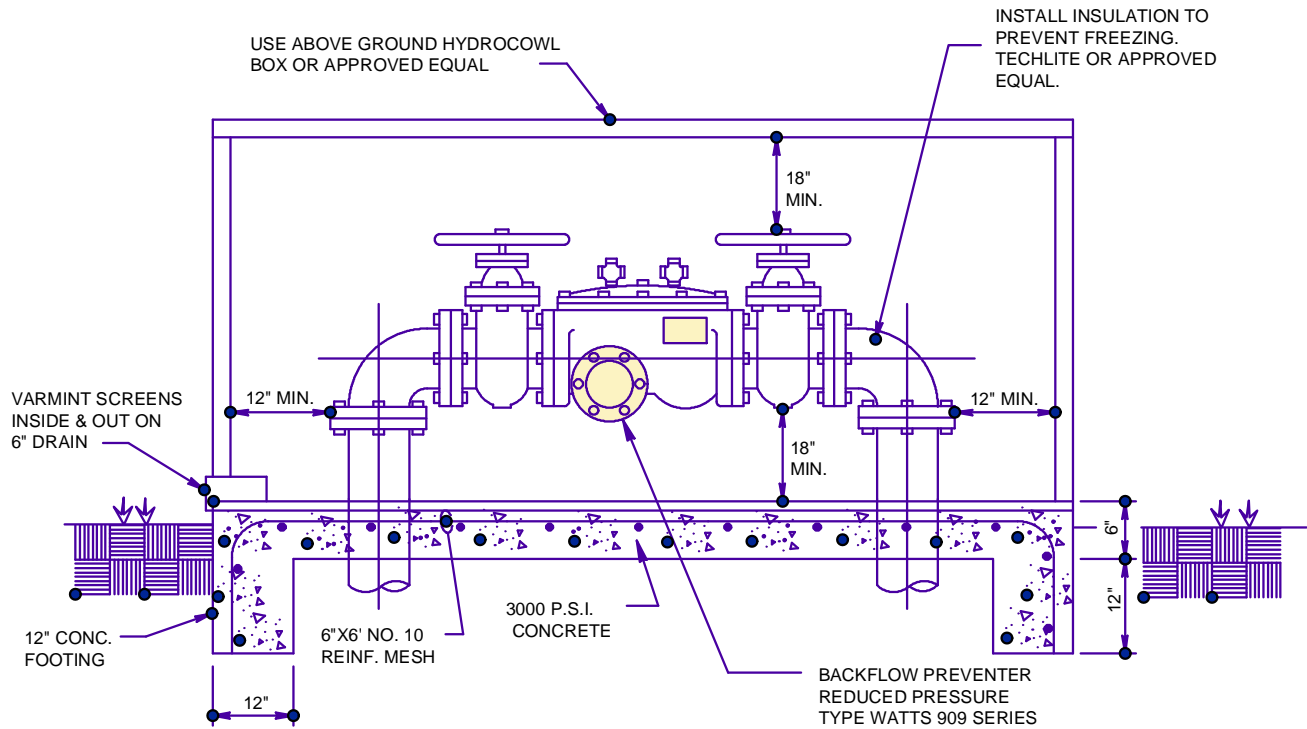


SECTION

## DOUBLE CHECK VALVE ASSEMBLY

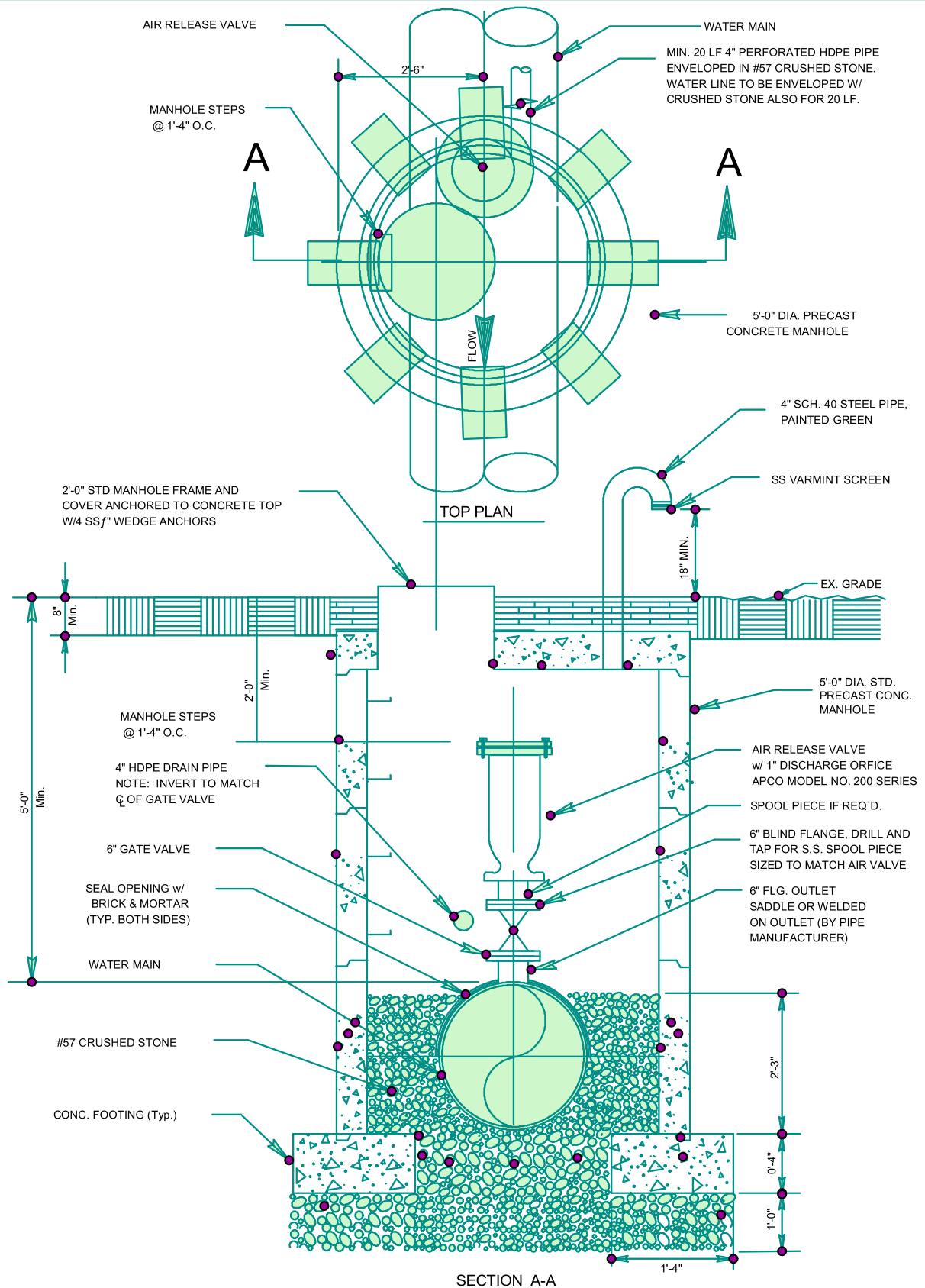
N.T.S.





## REDUCED PRESSURE BACKFLOW PREVENTER

N.T.S.



**AUTOMATIC AIR RELEASE VALVE MANHOLE DETAIL**

N.T.S.

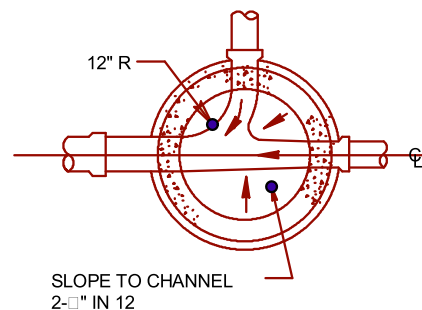
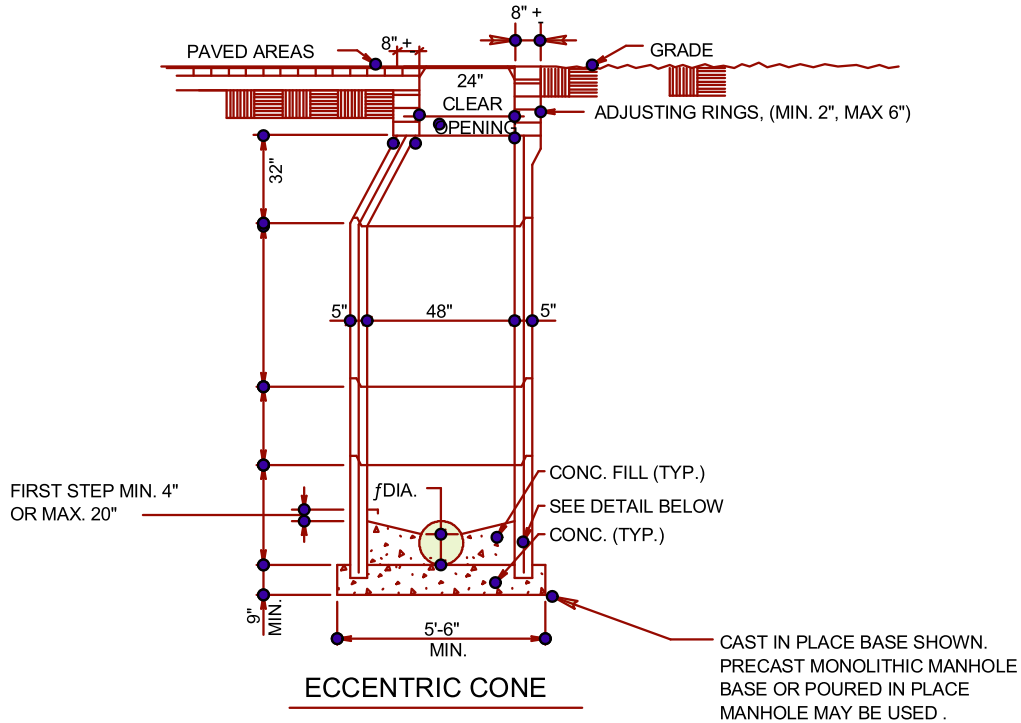
FEB. 2000

261A

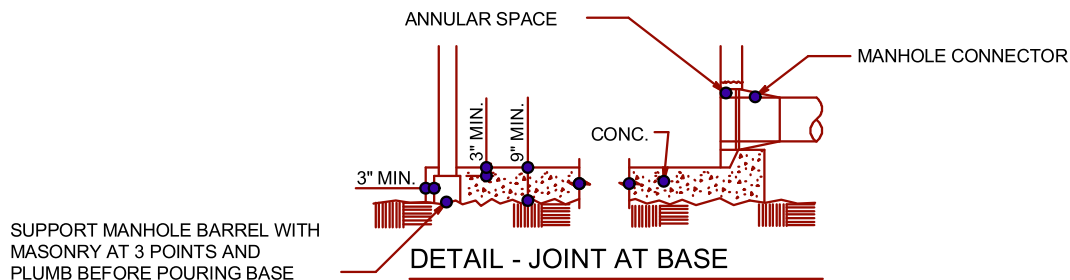
# GENERAL NOTES:

1. ALL MATERIALS, DESIGN, MANUFACTURE, PHYSICAL TEST REQUIREMENTS, FINISH, MARKING, INSPECTION, REJECTION AND REPAIRS TO MEET ASTM C478 FOR PRECAST REINFORCED CONCRETE MANHOLE RISERS AND TOPS EXCEPT AS MAY BE MODIFIED IN THESE SPECIFICATIONS.

2. SEE STANDARD DRAWINGS 106, 108, 109, AND 110 FOR ADDITIONAL DETAILS.
3. SIZE AND LOCATE PIPE CUTOUTS AS REQUIRED.
4. MANHOLE STEPS TO BE CAST IN PLACE.
5. GROUT ANNULAR SPACE AROUND PIPE INSIDE MANHOLE WITH NON-SHRINK GROUT.
6. ALL BRICK COURSES TO BE LAYED RADIAL WITH STAGGERED ALIGNMENT .



INVERT OF CHANNEL TO SLOPE ACROSS MANHOLE FROM INVERT OF OUTLET TO INVERT OF EACH INLET OR 6" WHICHEVER IS LESS

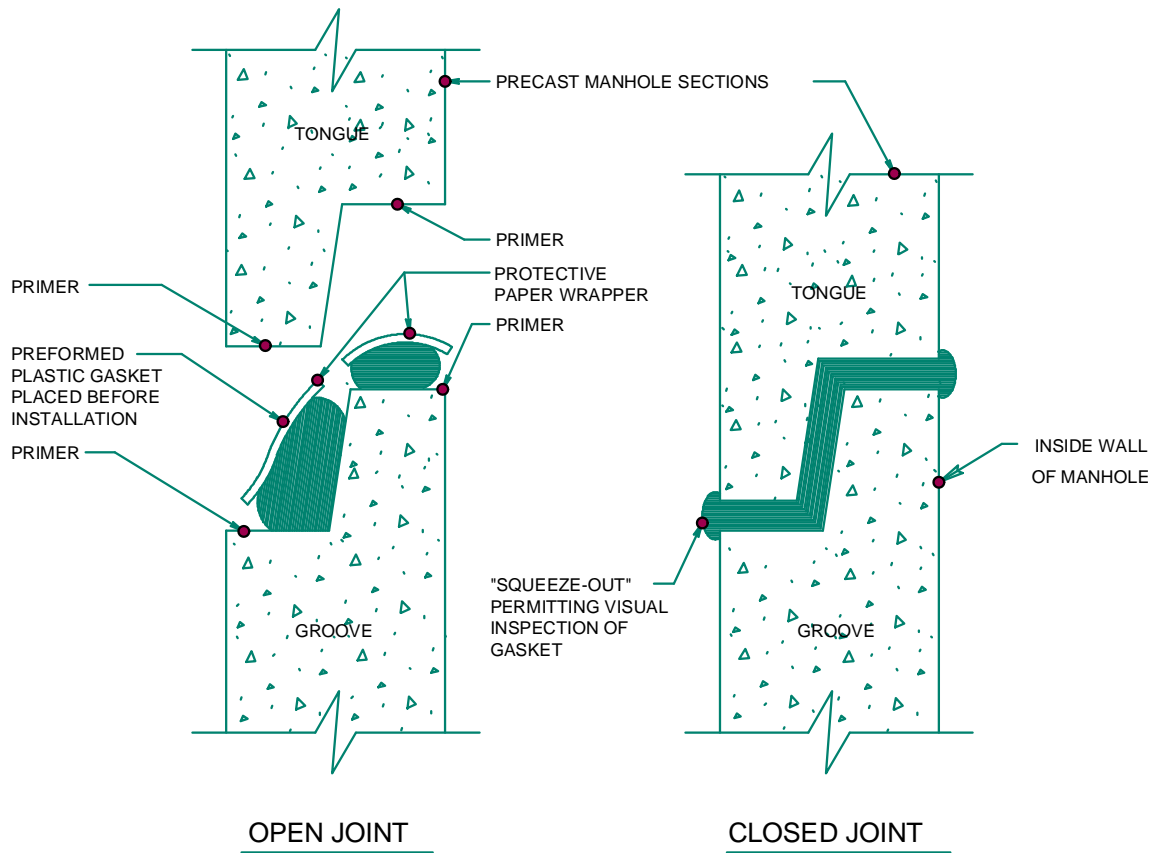


## **STANDARD PRECAST CONCRETE MANHOLES**

N.T.S.

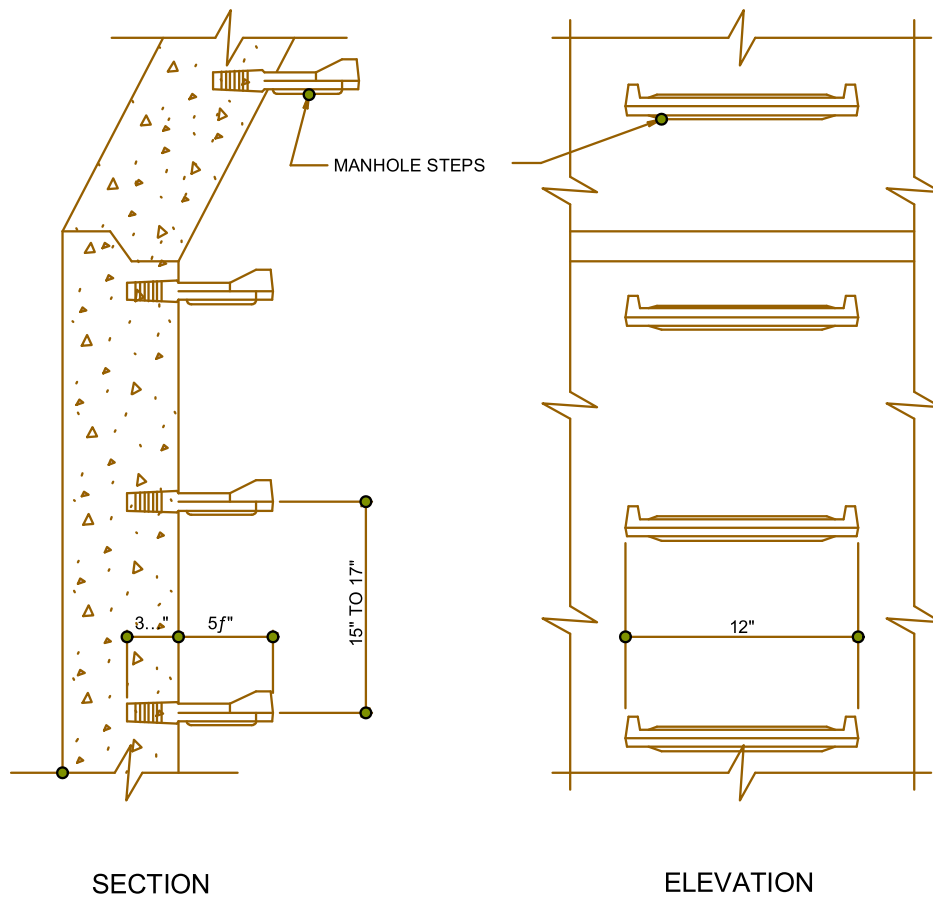
#### NOTES

1. WHERE MASTIC DOES NOT PROTRUDE, EITHER INSIDE OR OUTSIDE, POINT UP JOINT WITH GROUT.
2. TRIM PROTRUDING MASTIC ON THE INSIDE OF THE MANHOLE AND COVER JOINT WITH MOTAR GROUT .



### DETAIL OF PLASTIC GASKET FOR PRECAST MANHOLE SECTIONS

N.T.S.

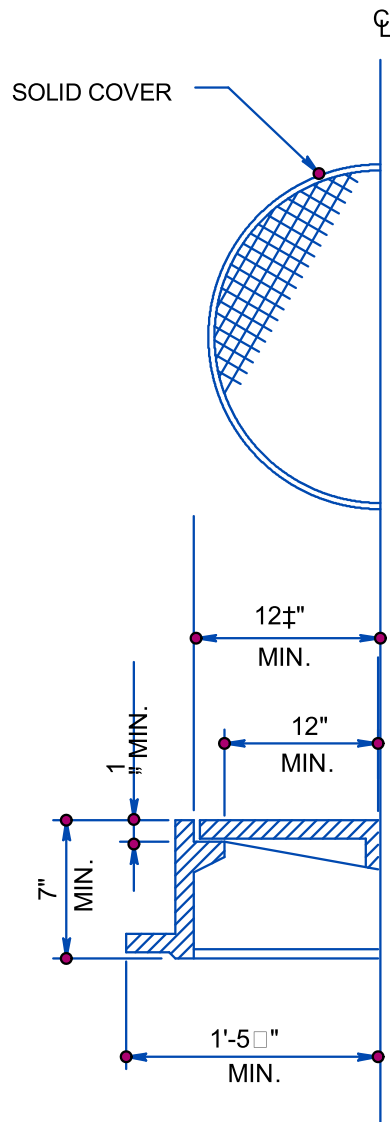


DETAIL OF STANDARD

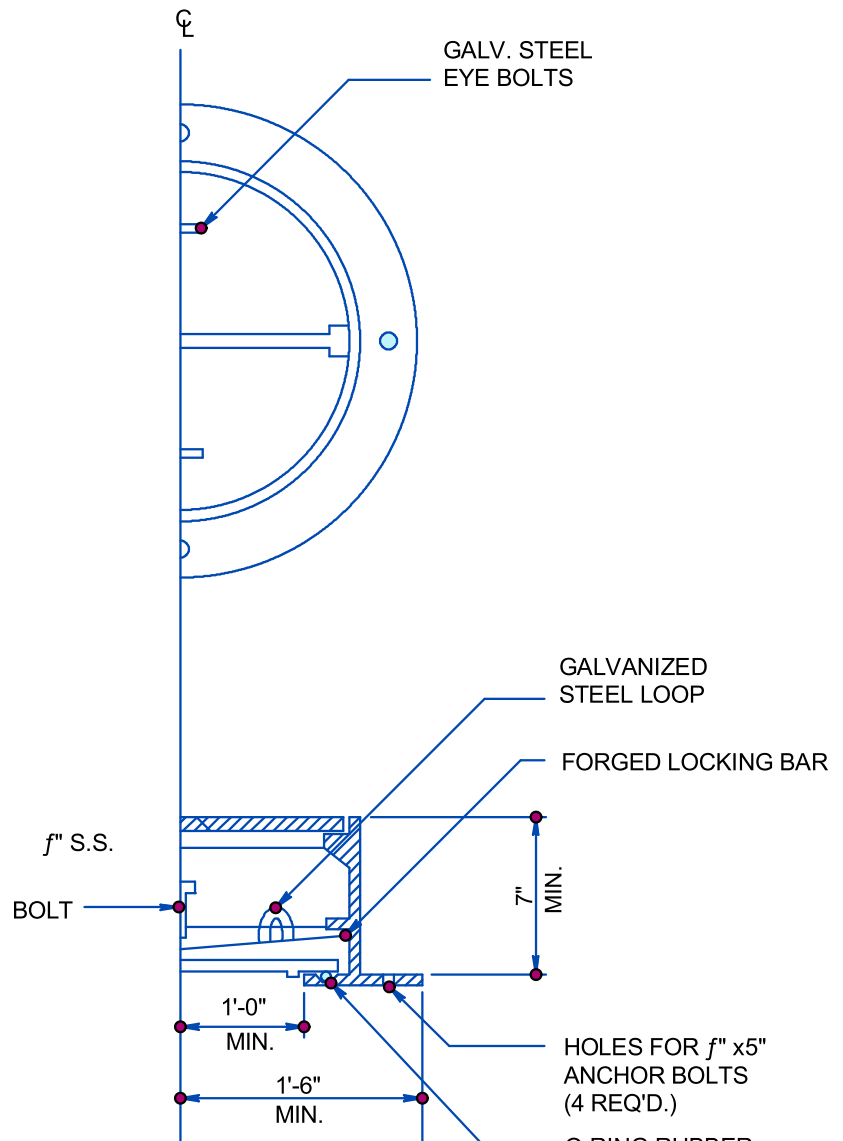
LADDER BARS

MANHOLES AND WETWELLS

N.T.S.



STANDARD



WATERTIGHT

NOTES:

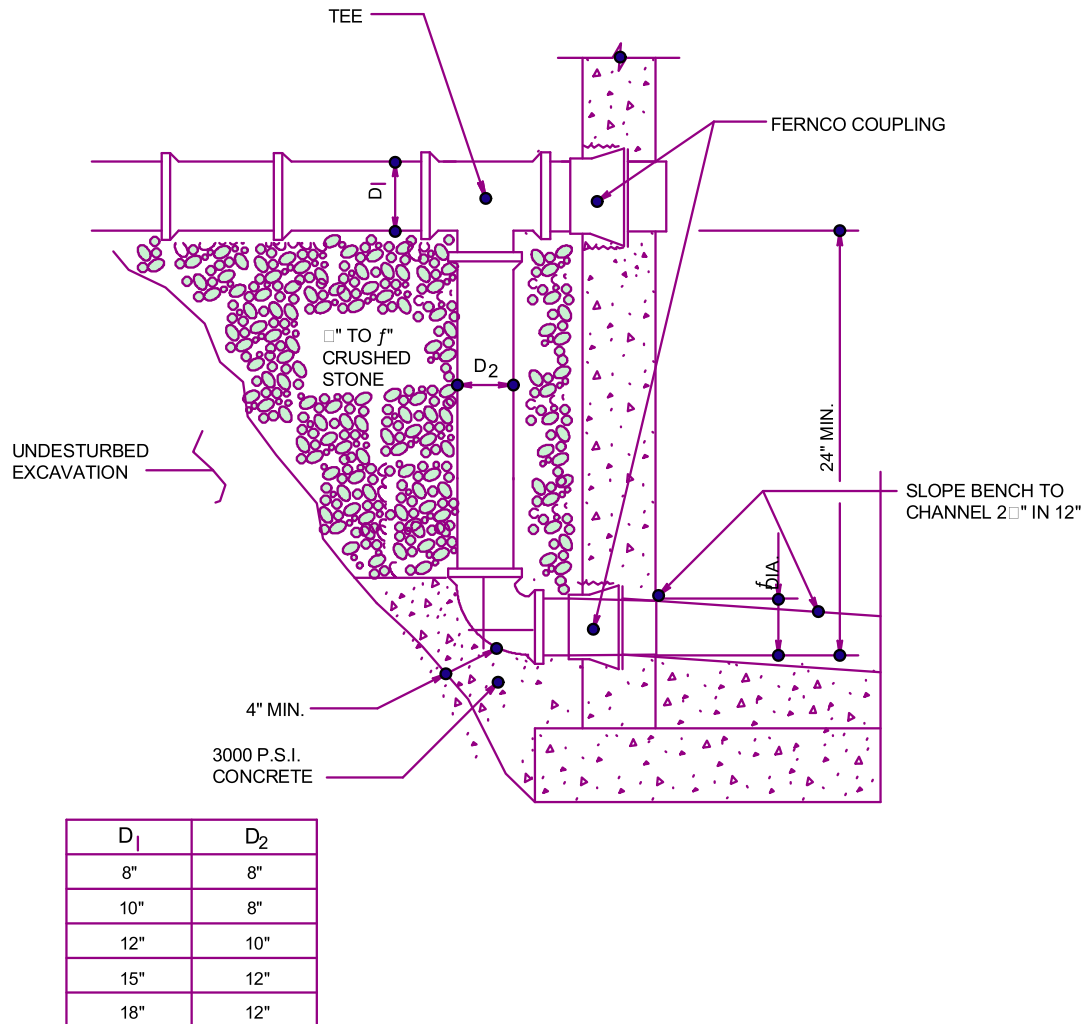
1. ANCHOR W.T. CASTINGS TO TOP CONE W/4  $f$ " BOLTS.
2. ANCHOR BOLTS TO BE CAST WITH CONCRETE CONE.

## FRAME AND COVER

N.T.S.

NOTES:

1. SET INLET INVERT FROM DROP TO MATCH CROWNS WITH OUTLET EXCEPT THAT MINIMUM FALL ACROSS M.H. INVERT MUST BE 3".
2. FOR DETAILS NOT SHOWN SEE STANDARD MANHOLE DETAIL 101.

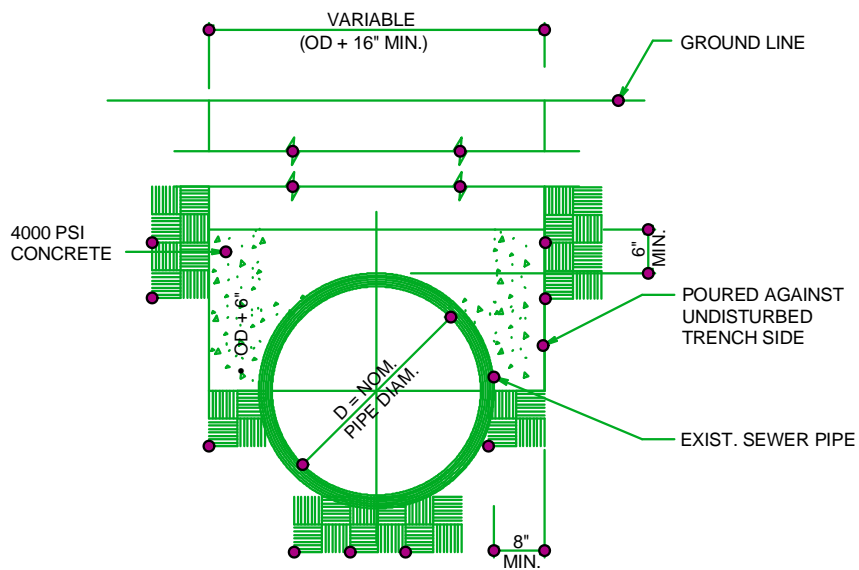


## STANDARD DROP MANHOLE

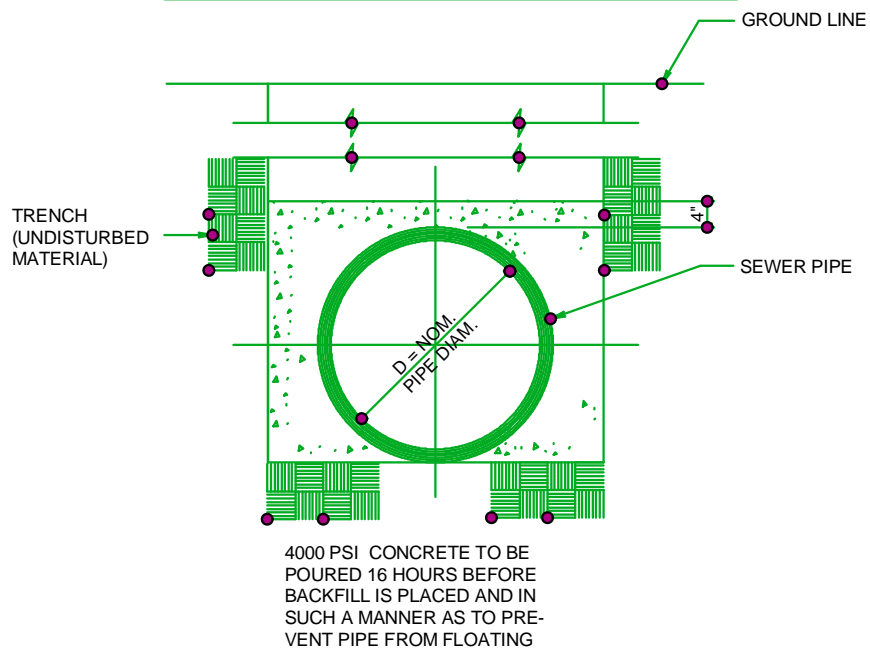
N.T.S.







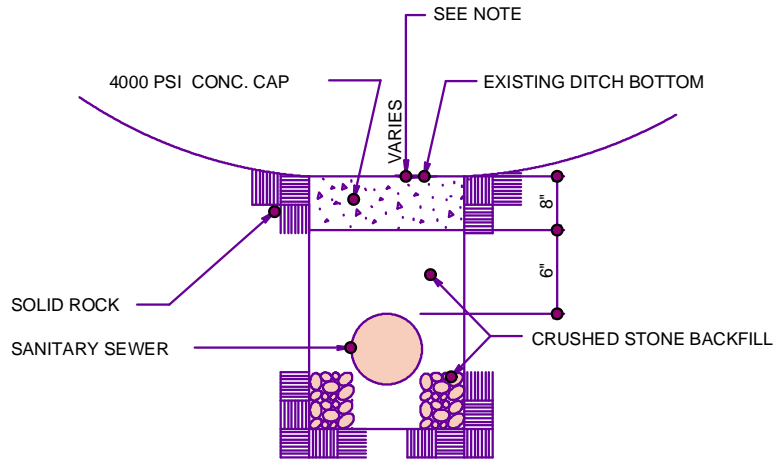
TYPICAL CONCRETE  
PROTECTION FOR EXISTING SEWERS



TYPICAL CONCRETE  
PROTECTION FOR NEW SEWERS

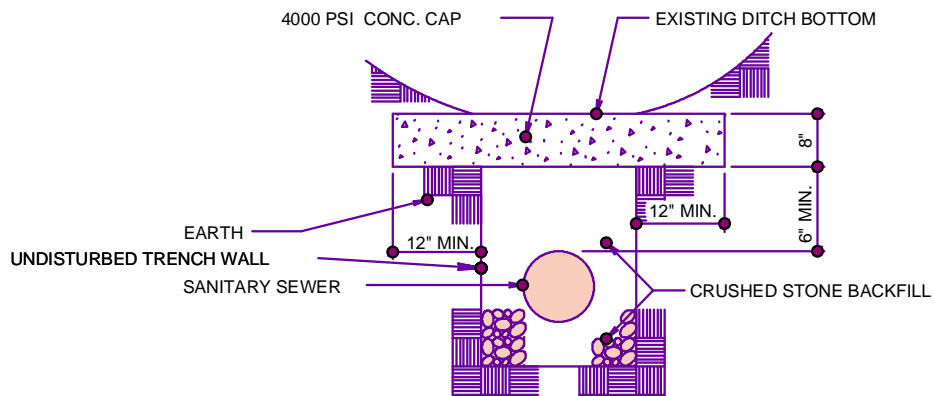
## CONCRETE PROTECTION

N.T.S.



NOTE:  
TOP OF CONCRETE TO BE  
AT ELEVATION OF EXISTING  
ROCK BOTTOM

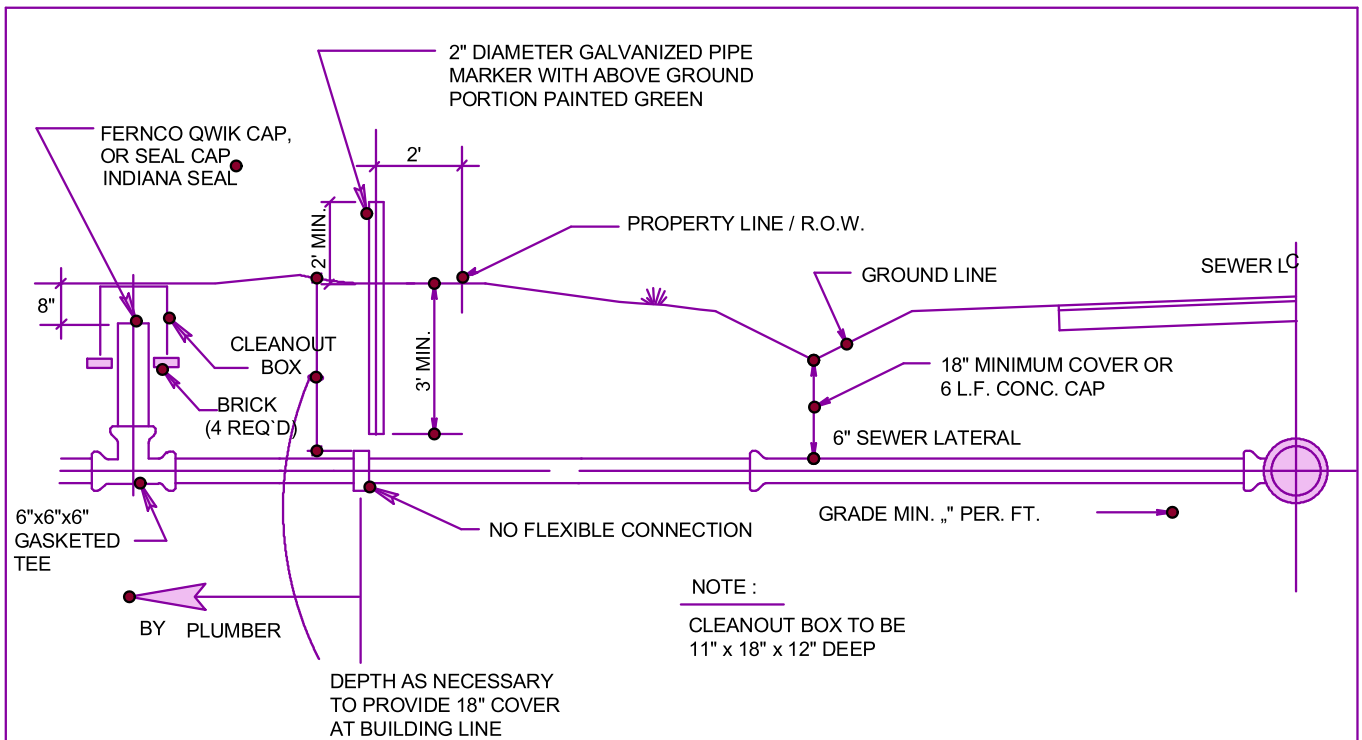
### ROCK EXCAVATION



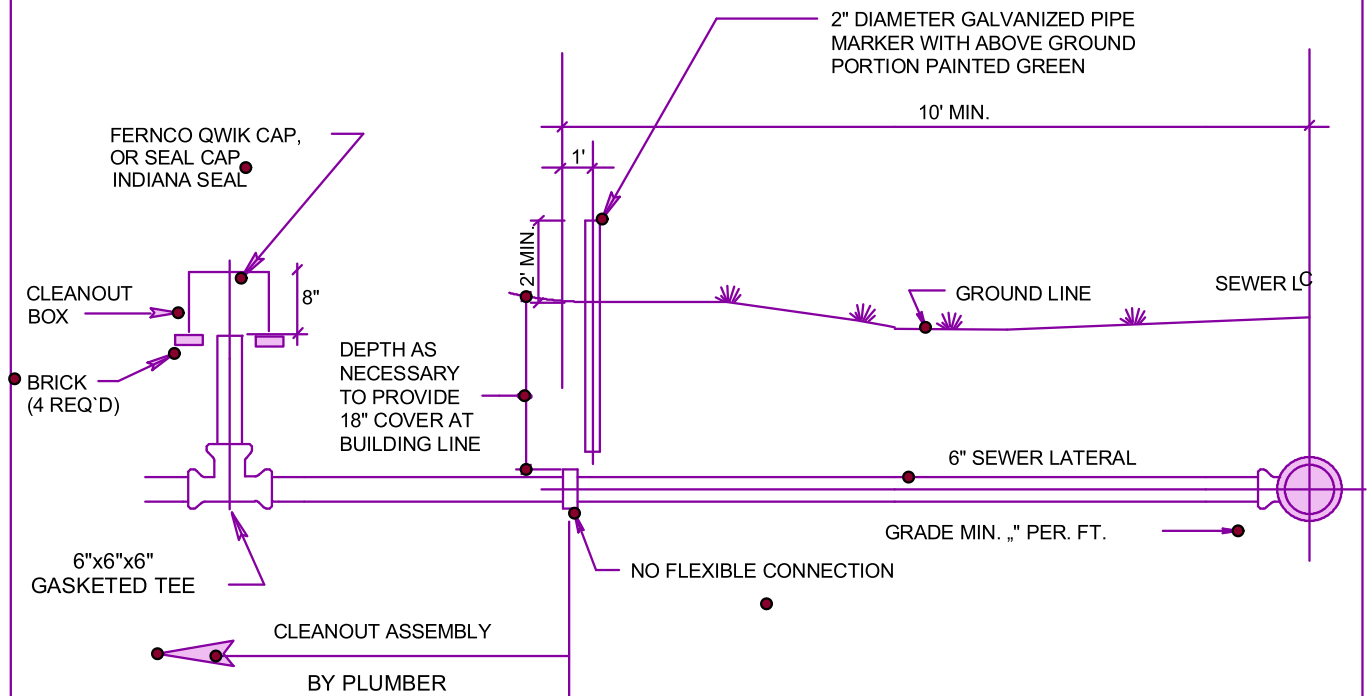
### EARTH EXCAVATION

### CONCRETE CAP

N.T.S.



### TEE BRANCH FROM STREET



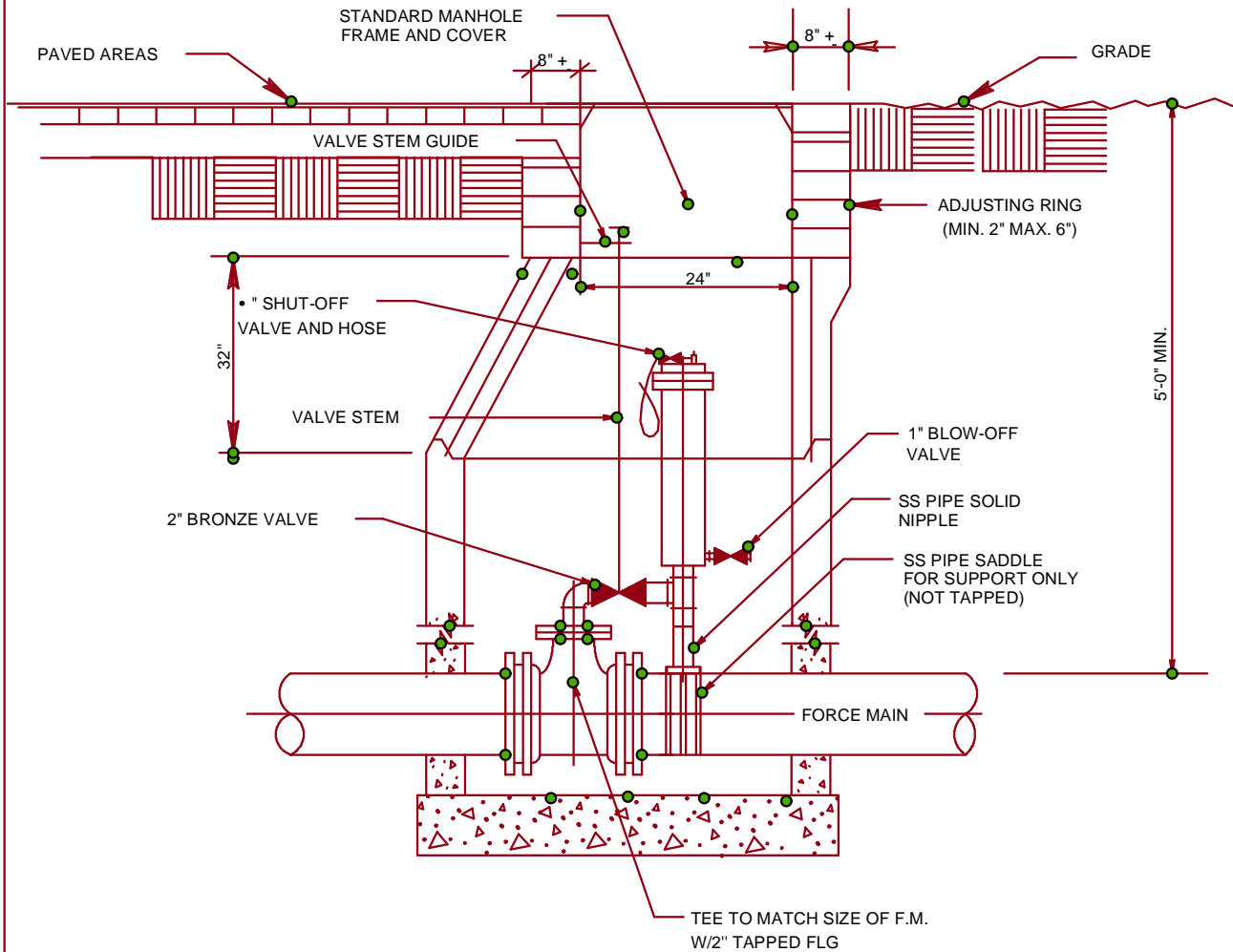
### TEE BRANCH IN EASEMENT

## SANITARY SEWER LATERALS

N.T.S.

**NOTES:**

1. AIR RELEASE VALVE TO BE "CRISPIN SEWER VALVE" , APCO 400 SEWAGE VALVE, OR EQUAL.
2. COMBINATION VALVE INSTALLATION TO BE SIMILAR EXCEPT VALVE TO BE APCO 445 COMBINATION SEWAGE VALVE.
3. MANHOLE TO BE MINIMUM 4' DIAMETER .
4. ALL BRICK COURSES TO BE LAYED RADIAL WITH STAGGERED ALIGNMENT .

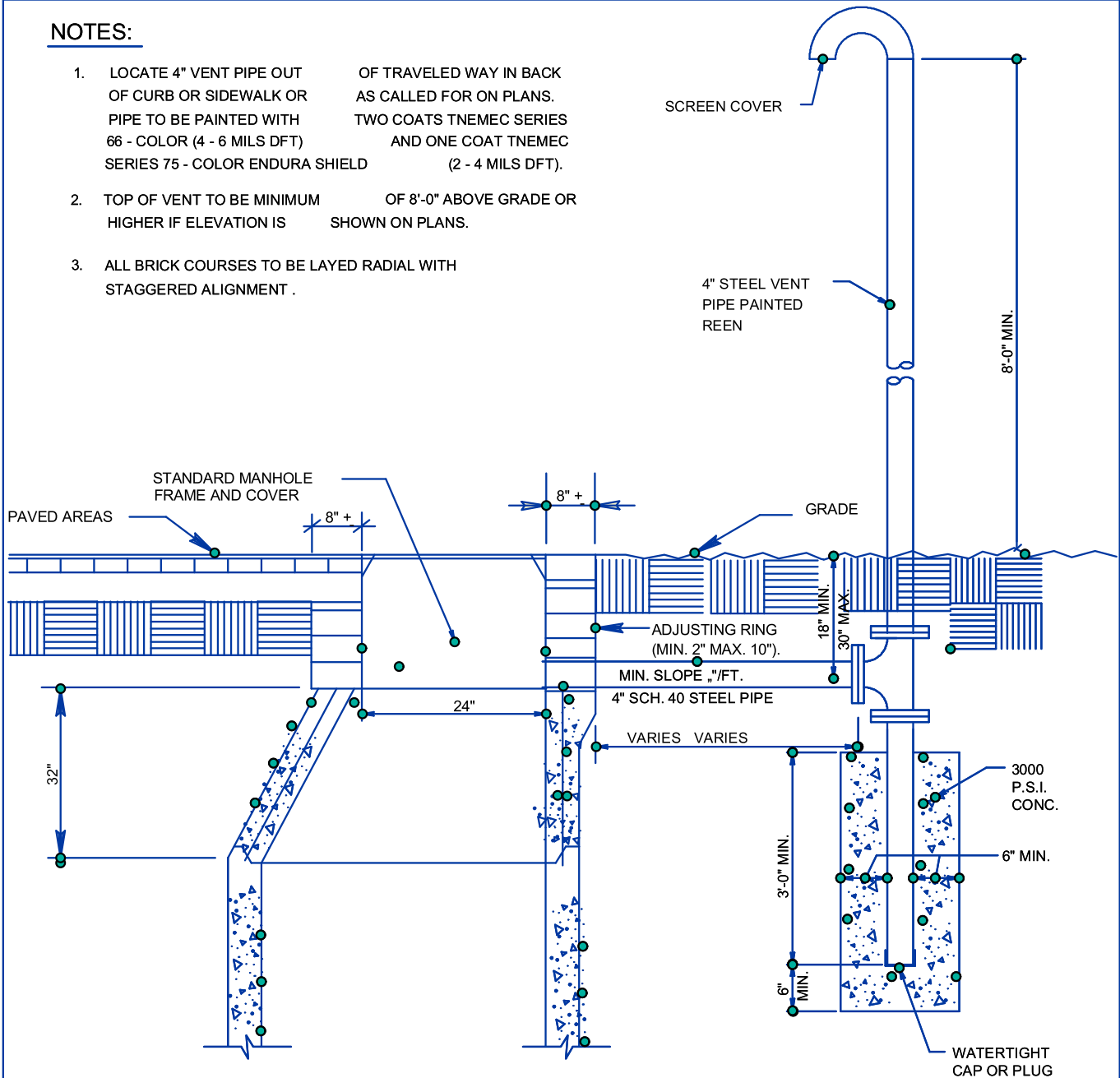


## AIR RELEASE VALVE SANITARY FORCE MAIN

N.T.S.

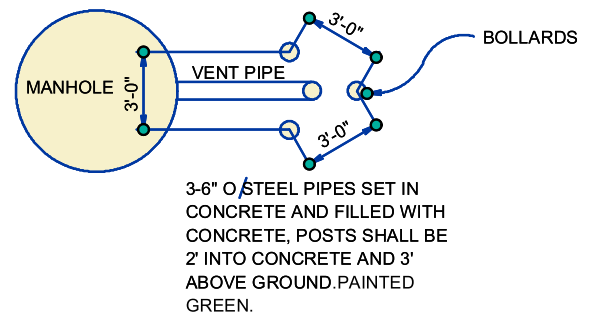
## NOTES:

1. LOCATE 4" VENT PIPE OUT OF CURB OR SIDEWALK OR PIPE TO BE PAINTED WITH 66 - COLOR (4 - 6 MILS DFT) TWO COATS TNEMEC SERIES AND ONE COAT TNEMEC SERIES 75 - COLOR ENDURA SHIELD (2 - 4 MILS DFT). OF TRAVELED WAY IN BACK AS CALLED FOR ON PLANS.
2. TOP OF VENT TO BE MINIMUM OF 8'-0" ABOVE GRADE OR HIGHER IF ELEVATION IS SHOWN ON PLANS.
3. ALL BRICK COURSES TO BE LAYED RADIAL WITH STAGGERED ALIGNMENT .



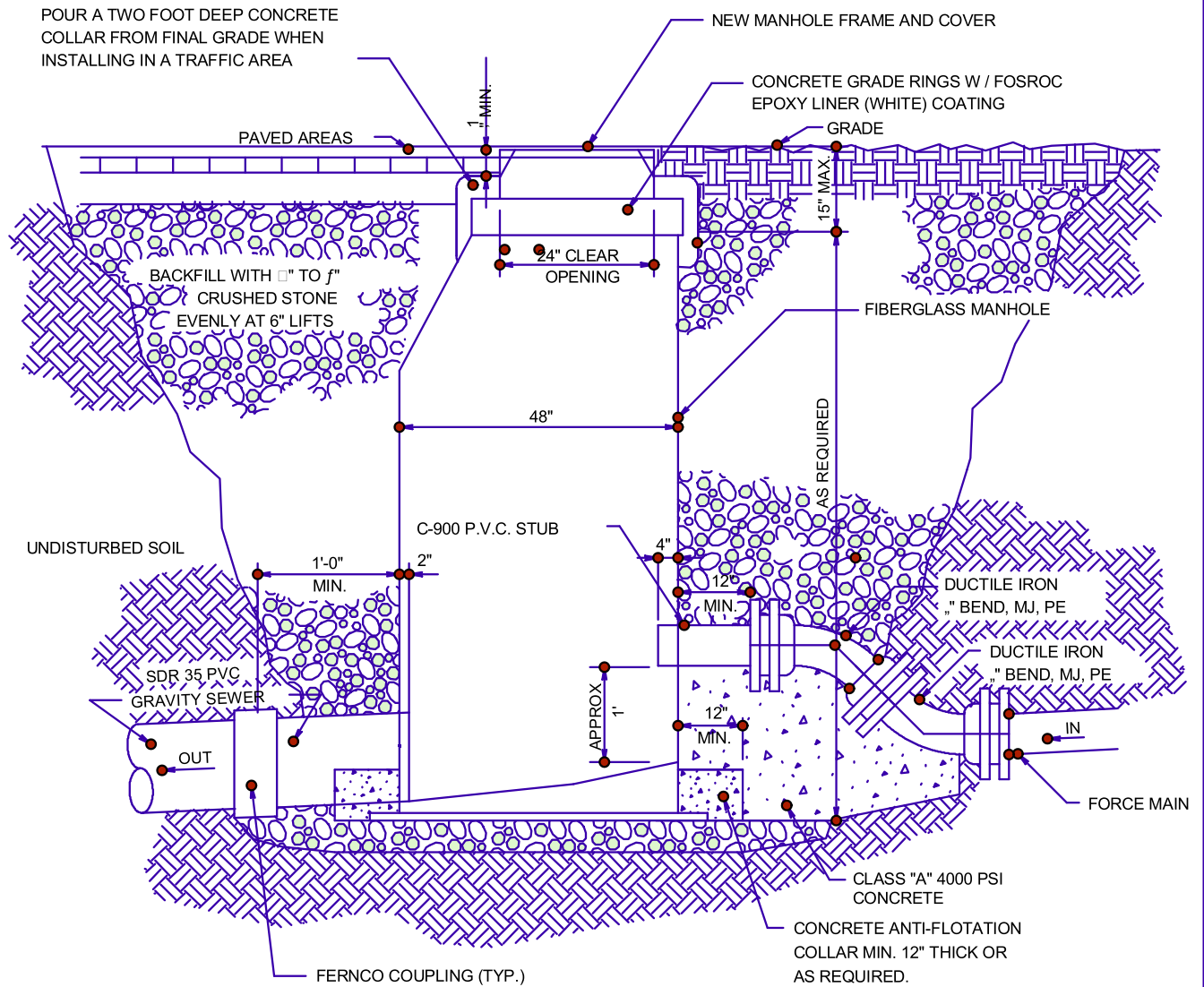
## STANDARD MANHOLE VENT

N.T.S.



# NOTES

1. ENTER WALL APPROX. 1' ABOVE CHANNEL IN FLOOR OF MANHOLE.
2. NEW FIBERGLASS MANHOLES TO BE 4" WALL THICKNESS.
3. STUB-INS TO BE INSTALLED BY MANHOLE MANUFACTURER.



## STANDARD CONNECTION OF FORCE MAIN TO FIBERGLASS MANHOLE

N.T.S.

NOTE:  
 PROVIDE FOR ENTRANCE  
 AND EXIT OF PRESSURE  
 SEWER THROUGH WALLS OF  
 VALVE BOX AT ANGLES REQ'D.  
 BY CHANGE IN DIRECTION  
 IF ANY.

LINE SIZE

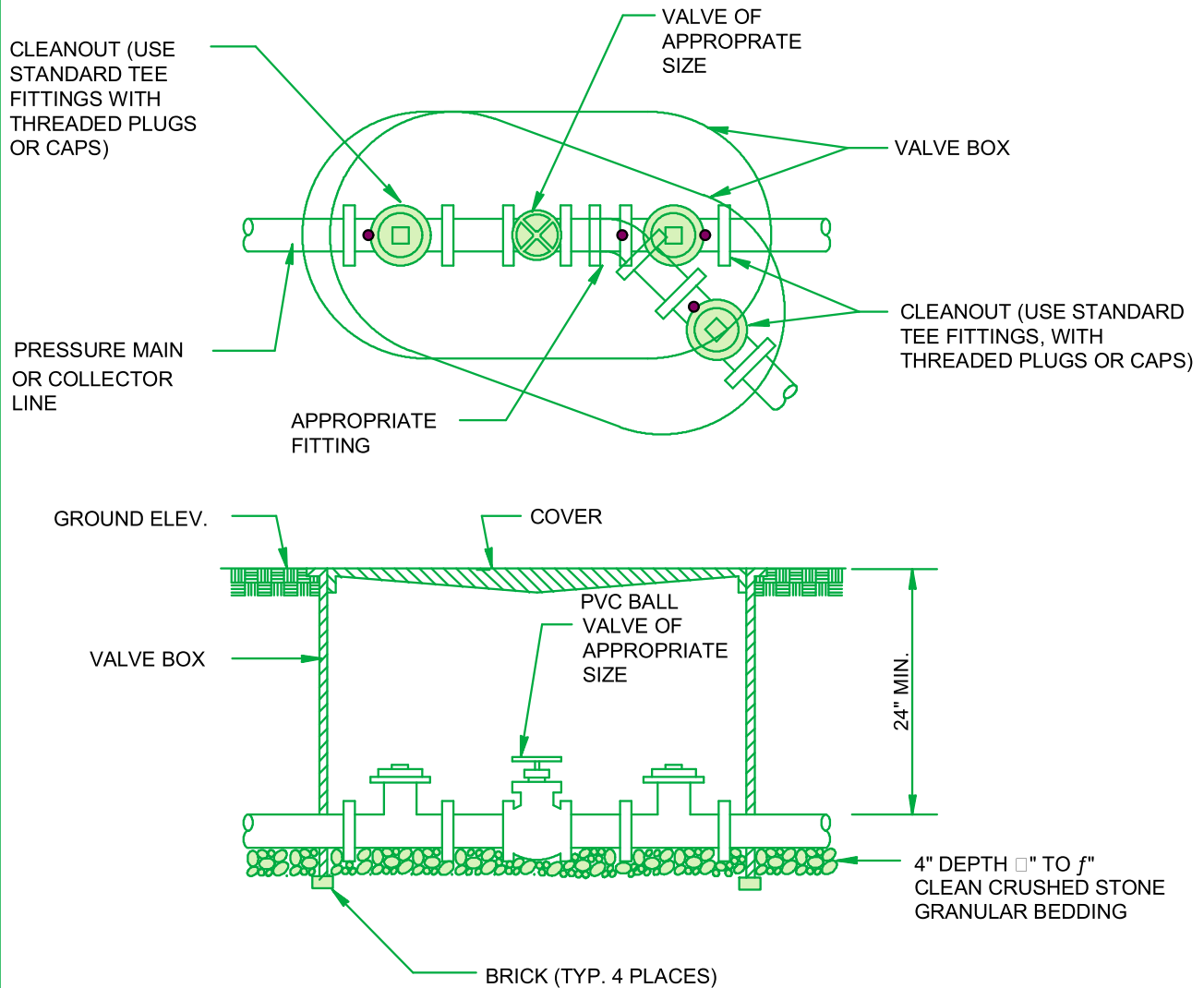
MIN. BOX SIZE

1" & 2"

17" x 30"

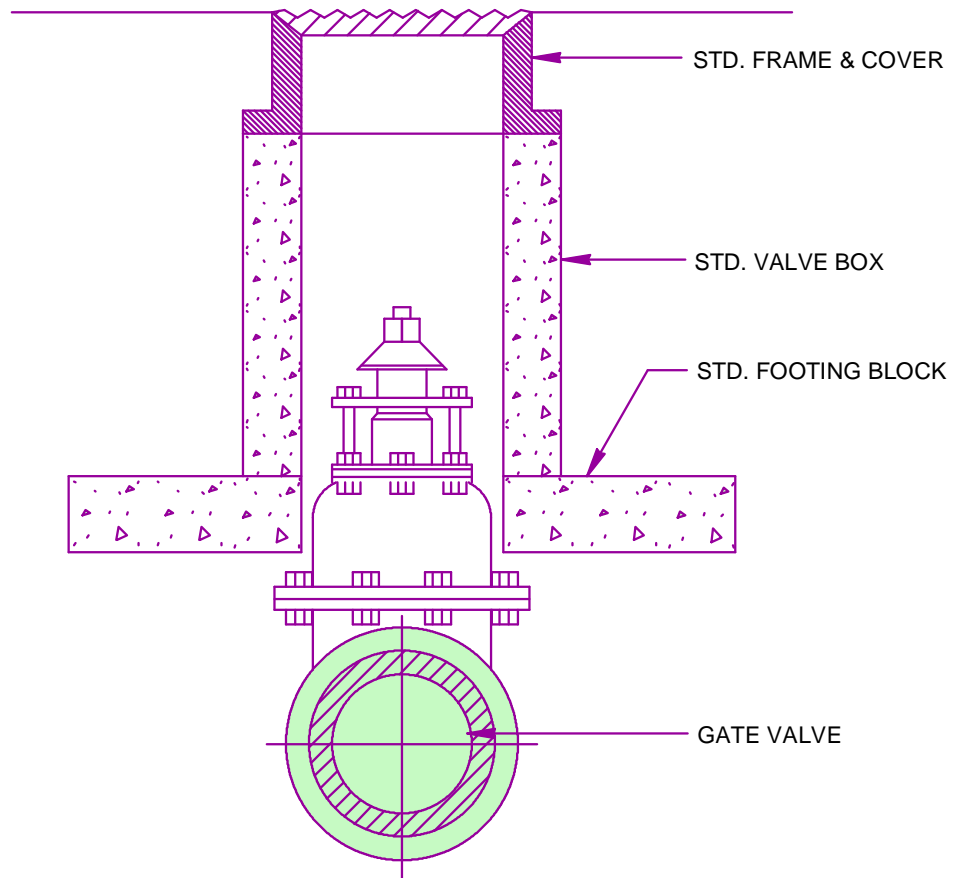
2" & 3"

24" x 36"



## VALVE BOX AND CLEANOUT ARRANGEMENTS ALONG STRAIGHT RUNS AND AT CHANGES IN DIRECTION

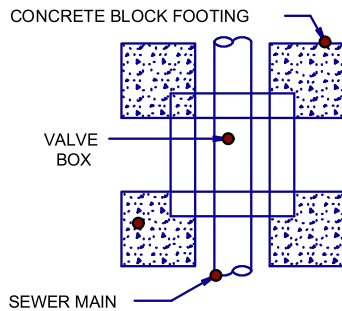
N.T.S.



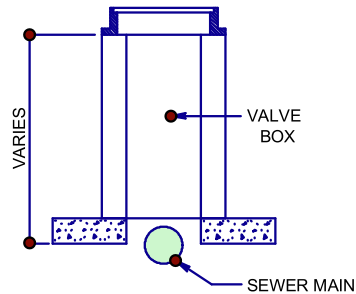
## TYPICAL VALVE BOX SETTING

N.T.S.

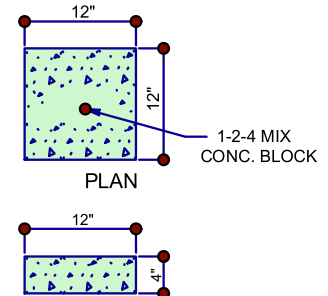




PLAN



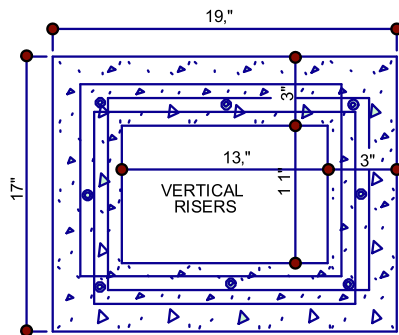
ELEVATION



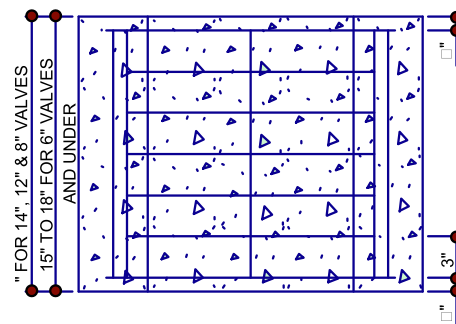
ELEVATION

NOTES:

1. FOUR (4) CONCRETE BLOCKS OF THE SIZE AND SHAPE SHOWN ARE TO BE PLACED UNDER EACH VALVE BOX, ONE UNDER EACH CORNER OF BOX.
2. NO REINFORCING IN FOOTING. CONCRETE MIX 1 PART CEMENT, 2 PARTS SAND AND 4 PARTS NO. 2 CRUSHED STONE OR GRAVEL. VOLUME FOR ONE BLOCK = 0.333 CU. FT. WEIGHT OF ONE BLOCK = APPROX. 50 LBS. FOR ALL FOUR BLOCK, WEIGHT = 200 LBS. BEARING AREA ON SOIL = 576 SQ. IN.



PLAN



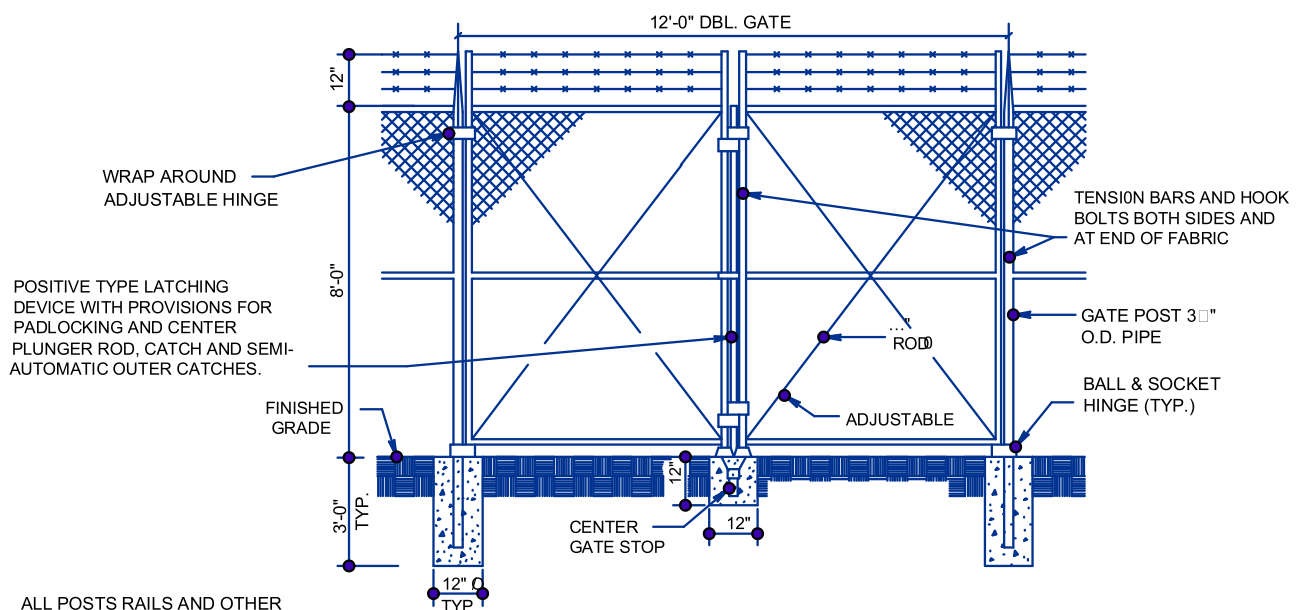
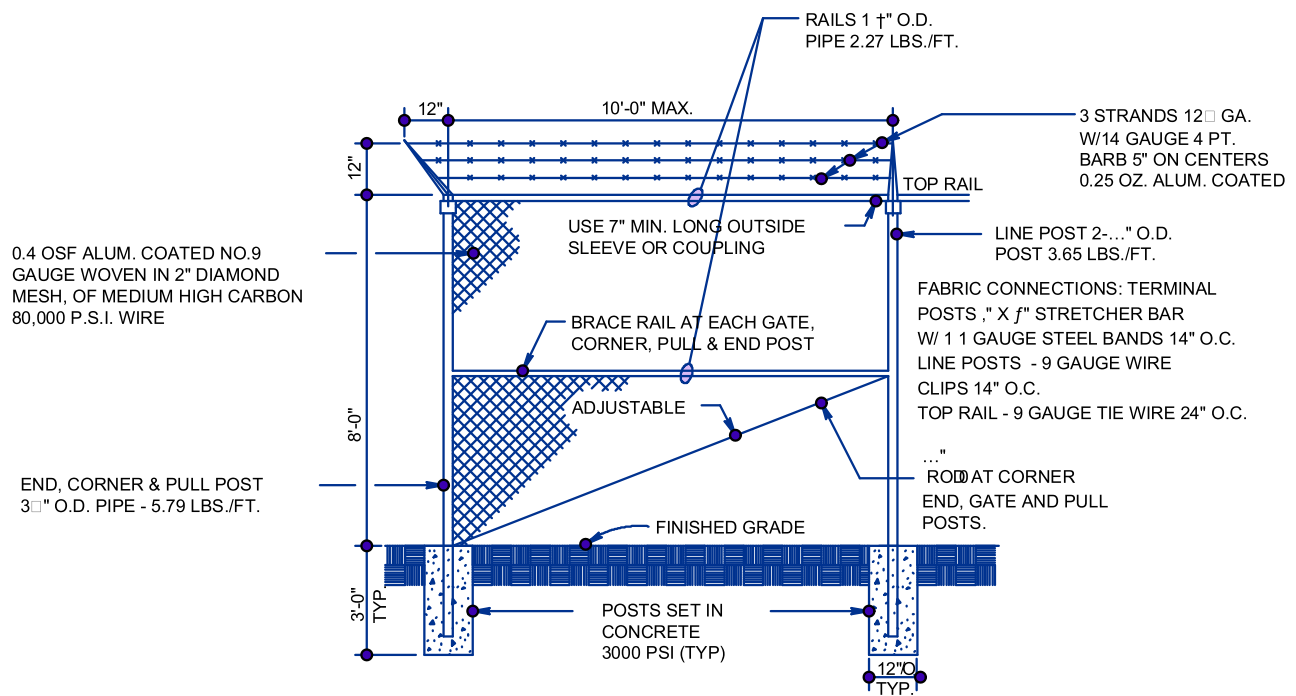
ELEVATION

NOTES:

1. REINFORCING TO BE " STEEL REINFORCING RODS PLACED HORIZONTALLY IN SQUARES 16" x 14" AND TO BE STAGGERED APPROX. AS SHOWN ON PLAN VIEW, ONE FOR EVERY 3" OF HEIGHT OF BOX. VERTICAL RISERS ARE TO BE 1" SHORTER THAN THE HEIGHT OF THE BOX AND SHALL BE PLACED IN EACH CORNER AND AT THE HALF WAY POINT OF EACH SIDE OF THE BOX USING 8 RISERS TO THE BOX. TOTAL LENGTH OF REINFORCING ROD FOR BOX APPROX. 47'.
2. CONCRETE MIXTURE TO BE 1 PART CEMENT, 2 PARTS SAND AND 4 PARTS NO. 2 CRUSHED STONE OR GRAVEL. TOTAL VOLUME OF MIXTURE FOR BOX APPROX. 2 CUBIC FT.

## STANDARD CONCRETE VALVE BOX

N.T.S.



ALL POSTS RAILS AND OTHER APPURTENANCES SHALL BE HOT DIP GALVANIZED W/MIN. 200 OSF ZINC. ALL FITTINGS SHALL BE MALLEABLE CAST IRON OR PRESSED STEEL.

## FENCE DETAIL

ALUMINUM

N.T.S.